APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR			WM. SAUNDERS.
AGRICULTURIST			JAS. W. ROBERTSON.
HORTICULTURIST			JOHN CRAIG.
CHEMIST			F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST			JAS. FLETCHER.
POULTRY MANAGER			A. G. GILBERT.
SUPT. EXPERIMENTAL FARM,	Nappan, N.S.		WM. M. BLAIR.
do	do	Brandon, Manitoba.	S. A. BEDFORD.
do	do	Indian Head, N.-W.T.	ANGUS MACKAY.
do	do	Agassiz, B.C.	THOS. A. SHARPE.

FOR

1892

PRINTED BY ORDER OF PARLIAMENT.

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST EXCELLENT MAJESTY
1893

[No. 7B.—1893.] *Price 25 cents.*

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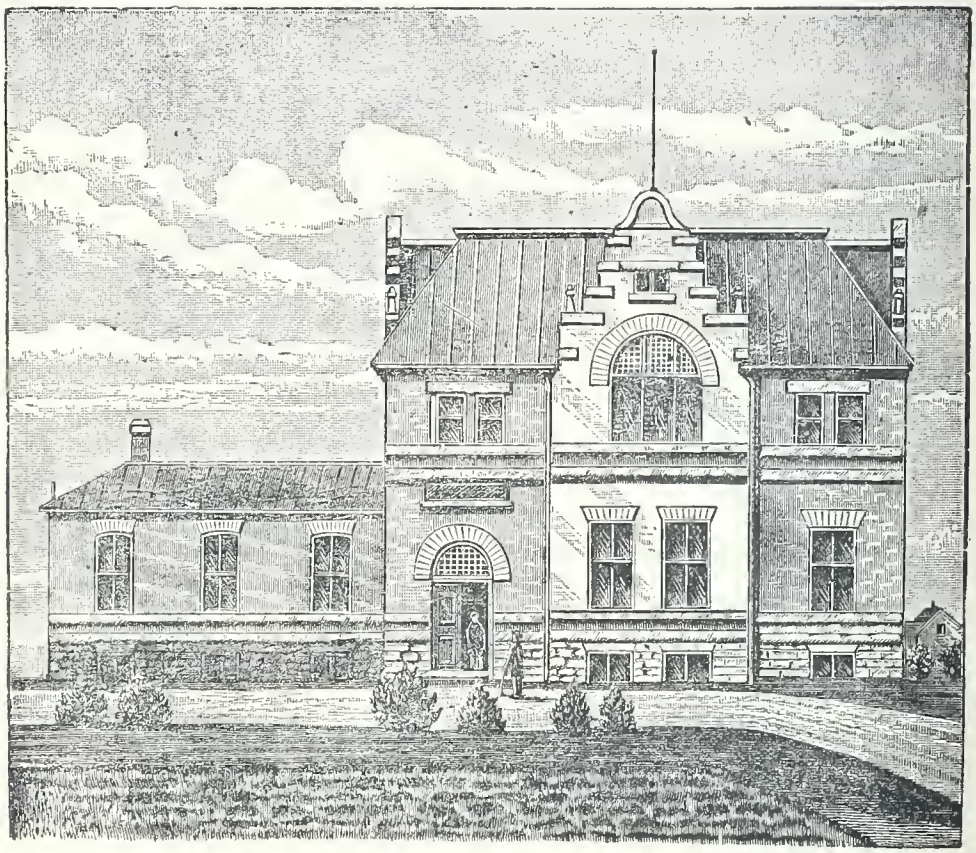


Figure 1.—Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 6th February, 1893.

The Honourable
The Minister of Agriculture,
Ottawa.

SIR,—I have the honour to submit herewith for your approval the sixth annual report of some of the work done and in progress at the several experimental farms which have been established in different parts of the Dominion.

You will also find appended reports from the following officers of the Central Experimental Farms:—From the Agriculturist, Mr. James W. Robertson; from the Horticulturist, Mr. John Craig; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Mr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the branch experimental farms there are reports from Mr. Wm. M. Blair, superintendent of the experimental farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, superintendent of the experimental farm for Manitoba, at Brandon; from Mr. Angus Mackay, superintendent of the experimental farm for the North-west Territories, at Indian Head; and from Mr. Thos. A. Sharpe, superintendent of the experimental farm for British Columbia, at Agassiz.

These reports embody the results of much careful experimental work bearing on agriculture and horticulture. They also contain information on chemical work relating to agriculture, together with many facts concerning injurious insects and plants and the best methods of preventing their ravages.

It is hoped that the results obtained from the experimental work recorded in this report will be helpful to all those who are engaged in cultivating the soil and that they will thus assist in the advancement of agriculture in this Dominion.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS.

REPORT OF THE DIRECTOR.

Six years have passed since the initial steps were taken towards establishing a sytem of Experimental Farms for the Dominion of Canada. Prior to this, during the Session of the House of Commons in 1884, a select committee was appointed of which Mr. G. A. Gigault was chairman to inquire into the best means of encouraging and developing the agricultural interests of Canada and this committee made a report in favour of the establishment of an experimental farm. No further steps, however, were taken in this direction until November, 1885, when an investigation was undertaken by the writer under instruction of the Honourable John Carling, Minister of Agriculture, for the purpose of ascertaining the condition of experimental work in agriculture in the United States, Great Britain and other countries and a report was prepared on this subject under date of 20th February, 1886, which was submitted to the House of Commons during the session of that year. "The Experimental Farm Station Act," which was based on the recommendations embodied in that report, was introduced shortly after and passed with the concurrence of both sides of the House, and on the 16th of October following, the organization was begun by the appointment of a Director to undertake the work.

One of the provisions of the Act required that the Central Experimental Farm, which was to serve the provinces of Ontario and Quebec should be located near the Capital, and prior to my appointment I had been instructed by the Honourable Minister of Agriculture to inspect those farms near Ottawa, some twenty in all, which had been offered for sale to the Government as sites for the Central Experimental Farm. Associated with me in this work was Mr. A. E. S. K. Barclay, of London, Ontario, a man of much experience in land inspection, whose advice and assistance was most valuable. After spending several weeks on this work it was found that none of the farms offered possessed the combined features desired in the Central Experimental Farm, when instructions were received to visit and inspect other farms not offered in the neighbourhood of the capital, when among others the present site was examined. Finding that this land, although in a very rough condition and parts of it very swampy, presented advantages greater than those of any other farm in the neighbourhood in its variety of soil, contiguity to the city, commanding position as to elevation, facilities for drainage, &c., which made it eminently desirable for the purpose, a report was prepared recommending that this farm be chosen. Shortly after this a portion of the land was purchased at private sale and the remaining area required was expropriated under the Act and the prices to be paid for the several portions subsequently fixed by the Dominion Arbitrators.

The day following that of my appointment as Director of Experimental Farms I left for the Maritime Provinces to enter on a systematic inquiry into the conditions of agriculture in all the settled portions of the Dominion from the Atlantic to the Pacific, for the purpose of ascertaining where the experimental farms which it was designed to establish in the several provinces could be best located so as to confer the greatest benefit on the farmers of the Dominion.

During the interval which had elapsed between the passing of the Experimental Farms Act and the appointment of the Director, many offers of land had been made to the Government in all the provinces and territories, and in justice to the parties concerned, it seemed necessary that all those farms offered, which were in central or promising localities, should be inspected and reported on, and to accomplish this involved much time and labour.

Since it was designed that the Experimental Farm to be established in the Maritime Provinces should serve the requirements of the three provinces, viz., Nova Scotia, New Brunswick and Prince Edward Island, there were many reasons why it was desirable that this farm should be located not far from the boundary line between Nova Scotia and NewBrunswick, so that it might be almost equally accessible to the farmers of these two provinces, and at the same time convenient for the farmers of Prince Edward Island. While all the farms offered to the Government in the Maritime Provinces were inspected and reported on, the greater care was given to the examination of those situated in the border counties of Cumberland and Colchester, in Nova Scotia, and of Westmoreland and Albert, in New Brunswick.

As soon as this preliminary survey of the sites offered in the Maritime Provinces was completed, the work was extended to Manitoba, the North-west Territories and British Columbia, and after nearly three months of continuous travel and inspection, I returned to Ottawa to report progress.

By the appointment on 1st November, 1886, of Mr. W. W. Hilborn, of Arkona, Ont., as Horticulturist of the Central Experimental Farm, the services of a practical farmer also those of a man of extended knowledge in fruit growing, were secured, and during my absence, under his supervision, work was begun on the Central Farm, and nearly twenty acres of the land ploughed before the winter set in. During the winter, Mr. Wm. M. Blair, of Truro, N.S., was selected as superintendent of the Experimental Farm for the Maritime Provinces, and as it had been arranged that each superintendent of the branch farms should, after appointment, spend several months with the Director at Ottawa to gain fuller information as to the aims and objects of the work, the practical knowledge of farming which Mr. Blair possessed, was made use of at the Central Farm when the spring opened. Mr. S. A. Bedford, of Moosomin, N.W.T., who was selected in May, 1887, as superintendent of the Experimental Farm for Manitoba, also joined the staff at Ottawa, which was further reinforced about the same time by the engagement of Mr. John Fixter, of London, Ont., as farm foreman. These all entered heartily into the undertaking, and bringing their practical knowledge to bear on the difficulties to be overcome, all branches of the work made rapid headway. On the 2nd of May the work of clearing, removal of stone, extracting of stumps and ploughing, was vigorously begun, and before the season closed a considerable area of land was cleared and brought under cultivation, the system of drainage to be carried out fully planned, some of the preliminary work done, and other improvements made. The contract for the fencing was let early in the spring, and completed before winter came.

During the summer the Maritime Provinces were again visited in company with Mr. Wm. M. Blair, whose intimate and practical acquaintance with the agriculture of these provinces, acquired by a life-long experience there, was of great assistance, and, after a second careful survey, the advantages offered by the present site of the Experimental Farm at Nappan, N.S., were recognized, and its purchase recommended. Subsequently, the recommendation was adopted, and the negotiations for the purchase completed during the following winter. This site is within half a mile of Nappan Station on the Intercolonial Railway, about eight miles from the boundary line between Nova Scotia and New Brunswick, and is easily accessible from Prince Edward Island. About three hundred acres were purchased, about two hundred of which were cleared and almost free from stumps; the other one hundred acres were wooded with spruce, larch, beech, maple and other useful trees. The advantages embodied in this site were variety of soil, partial shelter from prevailing winds, a central location, and proximity to the main line of travel. The soil of this farm fairly represents the better class of farms on the border line of the two provinces, and for a long distance on either side. It is

chiefly clay loam, more or less mixed with sand, becoming heavy or light, as clay or sand predominates, with some parts gravelly, and with a subsoil varying from clay to gravelly clay. The cleared land may be classified approximately as follows: Marsh or dyke land, valuable for the growth of hay, about 50 acres; lower upland, 50 acres, and higher upland, 100 acres. The higher land faces the west and overlooks the inlet from the Bay of Fundy, and commands a good view of the Macean river and the surrounding country.

Under the judicious management of Mr. Blair this farm has been greatly improved, underdraining has effected remarkable changes in the relative fertility of portions of the land, valuable experimental work has been conducted with grain, fodder plants, roots, &c., orchards and belts of ornamental trees have been planted, the necessary buildings have been erected, and the barns and stables provided with useful breeds of animals. The details of the work accomplished will be found in the reports of the superintendent, embodied in the annual reports of the Experimental Farms.

Later, in the summer of 1887, another tour was made through the west in company with Mr. S. A. Bedford, who had resided for many years in Manitoba and the North-west Territories, and whose experience of farm life on the plains made him a valuable adviser. The investigations extended from Selkirk, twenty-one miles east of Winnipeg, along the line of the Canadian Pacific Railway, to the western boundary of Manitoba. North of Brandon, the country was examined as far as Binsearth, and from this point along the line of the Manitoba and North-western Railway to Portage la Prairie. Many journeys were taken north and south of the lines of railway which involved over 500 miles of driving, and afforded an excellent opportunity of ascertaining the character of the soil and the condition of the settlers over a large portion of the province.

After much consideration a site near Brandon was recommended and finally chosen, a farm of about 625 acres situated partly in the valley of the Assiniboine and partly on the higher land adjoining. This farm combines the advantages of variety of soil, fertile valley land for pasture, extending to the river, a rich sandy loam on the rise towards the bluffs which form the margin of the valley, on the sloping sides of which and in the ravines the soil is lighter, more sandy and gravelly, while on the heights the land is good and fairly represents the soil in most of the great wheat-growing districts of Manitoba. It adjoins the city of Brandon and is near the centre of one of the best agricultural sections in the province, it has an abundant supply of spring water of excellent quality is beautifully situated and in full view of the passing trains of the Canadian Pacific Railway.

Possession of this farm was had early in July, 1888, and since then under the superintendence of Mr. Bedford, rapid and satisfactory progress has been made in every department of the work. Particular attention has been devoted to experiments with grain, fodder crops and the best methods of treating the soil to prepare it for crop. The farm has been greatly beautified by the planting of avenues and groves of trees; commodious buildings have been erected and some of the most useful breeds of cattle introduced. Particulars of the progress made will be found in the annual reports.

During October, 1887, an extended tour was made through that part of the North-west Territories extending along the main line of railway, special attention being paid to that portion known as Eastern Assiniboia. The district lying between the Manitoba boundary and Fort Qu'Appelle, was driven over involving journeys in vehicles of over 400 miles in company with Mr. Bedford and Mr. A. Mackay of Indian Head; a wide area of country was inspected and examinations made of the character of the soil and much information gathered regarding the climate and especially with regard to rainfall. Similar investigations were made in the neighbourhood of Regina, Moose Jaw, Medicine Hat, Calgary and other important stations along the main line of railway.

Since by far the larger area of land in this part of the country is open prairie it was thought best to select a section of bare prairie for this farm with the view of showing what might be done in such case to provide eventually shelter both for crops

and buildings by tree planting. Several excellent sites were seen, but a section of land which was examined near the town of Indian Head was found to combine more advantages than any other farm inspected and this was finally chosen for the Experimental Farm for the North-west Territories. This section, No. 19, Township 18, Range 12 west, adjoins the town of Indian Head on the east, it lies north of the railway which skirts its boundary for about a mile. The soil is deep and of excellent quality and varies from a heavy clay to a sandy loam with a clay subsoil of a yellowish brown colour. The farm consists of 680 acres of land is situated 104 miles west of the Manitoba boundary, 105 miles north of the United States boundary and 44 miles east of Regina ; it is in the midst of a large and thriving agricultural settlement, is well supplied with water and its distance from the Indian Head railway station is but little more than half a mile.

Possession of this farm was had early in the spring of 1888 when Mr. A. Mackay who had received the appointment of superintendent and had spent some weeks on the Central Farm in Ottawa, entered on his duties on the 24th of April. During 1888 this farm was partly fenced and the fencing completed early in 1889 during which year buildings were also erected, dwellings, barn and stables and for the past four years the work of experimenting in all lines of agriculture and horticulture likely to be useful to the farmers of the North-west has been successfully carried on. A large number of young forest trees have been planted and the farm is now practically provided with shelter belts, forest clumps, avenues and hedges which although the planting is so recent are rapidly improving the general appearance of the farm and changing its character. Suitable breeds of dairy and beefing cattle have been supplied for the improvement of stock also swine and poultry and all are being utilized for experimental work. The results of tests of grain and fodder crops have been very useful and have shown that it is of the greatest importance that land to be cropped in this district should be fallowed during the previous summer as this treatment is almost invariably followed by good results. A large number of the hardier varieties of fruits have been tested, but while some sorts of small fruits such as gooseberries, currants, and raspberries do well, no satisfactory results have yet been obtained with apples, pears, plums or any of the larger fruits. A lively interest is taken in the results of the work at this farm by the settlers in the territories and especially by those residing near it in Eastern Assiniboia and the distribution of the annual reports giving the particulars of the practical work carried on by Mr. Mackay has already produced results which are highly gratifying.

The Experimental Farm for British Columbia was the last selected and put in operation. Two visits were made to this province within a year, the first in December, 1886, to gather preliminary information and acquire some general knowledge of the condition and requirements of the agriculture of the province and the second in September, 1887, for the special purpose of finding some suitable spot for the establishment of an experimental farm. During the latter visit I was accompanied by Mr. S. A. Bedford who gave much valued assistance. During these visits opportunities were afforded of examining many farms both on Vancouver Island and on the main land but of all the sites inspected none appeared to unite so many advantages as a part of the land belonging to the Agassiz estate adjoining the railway station known as Agassiz in the valley of the Fraser about 70 miles east of Vancouver. The land offered at this place for the purposes of an experimental farm and which was finally chosen consists of about 300 acres, opposite and adjoining the railway station with a frontage along the railway track of about half a mile. Along the western boundary is the road leading to the Harrison Hot Springs, a place of great resort five and a-half miles distant and in the rear rise rocky heights—with intervening patches of bench land—from 900 to 1,200 feet in height, more or less covered with shrubbery and heavy timber. About 35 acres of the valley land had been under partial cultivation and about 200 acres more had been cleared of most of the large timber with the stumps cut close to the ground but still undecayed and the surface occupied with brushwood and ferns. The soil varies from a clay loam through different grades of sandy loam to a soil of a gravelly character, with a porous subsoil, some parts sandy others a sandy clay under most of which lies a bed of gravel from three to five feet below the surface.

The land at Agassiz was purchased in 1888, but owing to delay in perfecting the title, it was not taken possession of until the autumn of 1889. Mr. Thos. A. Sharpe one of the early settlers in Southern Manitoba was appointed as Superintendent in July, 1889, and after spending a few weeks at the Central Farm he left for the coast taking with him horses and other supplies, and began work on the premises on the 19th of September, and before spring arrived the land formerly under cultivation had been thoroughly ploughed and prepared, and enough new land broken up and cleaned to admit of the planting of several orchards, and at the same time carry on a number of experimental tests with grain, fodder, crops and roots, particulars of which are given in the report of the Experimental Farm for 1890. Under the energetic management of Mr. Sharpe, the clearing of the land has been steadily pushed, and up to the present time one hundred and five acres have been brought under cultivation, and twenty acres more cleaned and stumped and ready for the plough. A dwelling for the superintendent has been erected, and a large combined barn and stable built which affords accommodation for stock and horses. Several of the best breeds of dairy cattle have been sent there, with swine, sheep and poultry, all of which are doing well. The climate is mild, much like that of some parts of England, and is well adapted for fruit growing. Since this promises to soon become one of the leading industries in that province, special attention has been given to the securing of a large number of varieties embracing the promising sorts in all classes, the object in view, being to establish large test orchards where the relative value of all varieties suited to the climate will be ascertained, and from the experience gained, information can be given to those about to plant as to the sorts best adapted to the climate, and those which promise the most profitable returns. Although only three years have elapsed since this enterprise was begun, there are now growing and under test at that farm 887 varieties of fruit, 569 of which are different sorts of large fruits, and 318 of small fruits. To bring together this collection, which is probably the largest on the continent, the nurseries of many countries have been laid under tribute, and whether received from the north or the south the trees seem to grow equally well, and with such rapidity as to astonish those who are accustomed only to the slower growth seen in the east.

Here also the different varieties of nut bearing trees are being tried: English and Japanese walnuts, hard and soft shelled almonds, Spanish, Japanese and American chestnuts, Kentish filberts, with pecans and hickory, and they all grow luxuriantly. British Columbia is noted for the wealth of its timber resources which are practically inexhaustible, but there are no hard woods of any consequence in that province. Hence in addition to the plantations of fruit and nut trees belts of hard woods have been and are being planted, in the valley and scattered also over the hill-sides, consisting of black walnut, butternut, elm, ash, hickory and other valued eastern and northern trees, and with the relatively rapid growth which trees make in that country the question as to how valuable these trees may be in that province will soon be determined, and if it can be shown that the so-called bench lands which are of little use for agricultural purposes can be gradually transformed into orchards and plantations of valuable hard wooded timber these experiments will prove of great value to that country.

In the meanwhile rapid progress has also been made at the Central Experimental Farm where a wilderness has been transformed into a series of well appointed fields, orchards and testing plots. Experiments have been carried on in all directions to test the earliness of varieties of cereals, their relative superiority in yield, quality of grain, stiffness of straw, &c. Those which have succeeded best have been scattered broadcast by a free distribution through the mails and thus about 30,000 sample of 3 lbs. each have been placed in the hands of about 12,000 to 15,000 farmers and these newer sorts are already in some localities influencing favourably the general character of the crops. The relative advantages resulting from early as compared with late sowing for the provinces of Ontario and Quebec have been clearly demonstrated by a series of tests extending over a period of three years, A large number of new varieties of grain have been originated here by cross-fertilization and some of them promise to be of great value. This work has been extended during the past year,

and new varieties originated by this method on each of the western farms also, with the hope that new sorts which have their birth-place in the countries in which they are to be grown will probably be better adapted to the climatic vicissitudes which they will have to endure. Varieties of fodder plants and roots have been tested in great numbers and the results of the work published in reports and bulletins; hundreds of thousands of which have found their way into the hands of appreciative readers.

The horticultural work has also made rapid progress, first under the superintendence of Mr. W. W. Hilborn and more recently under that of Mr. John Craig. A very large collection of fruits has been accumulated and the trees are now fast coming into bearing. Of small fruits a multitude has already been reported on, new varieties of much promise have been originated while a large number of different sorts of vegetables have been tested as to earliness, quality and other important points. The diseases which affect fruit trees and vines have been watched and the remedies which have been recommended thoroughly tested and the results given to the public in the annual reports.

With the appointment of Mr. James Fletcher, early in 1887, to the position of Entomologist and Botanist to the Dominion experimental farms, the subjects of insects and plants injurious to crops and the remedies for their subjugation have been made a subject of special study, much useful experience has been gained and the results have been given in reports and bulletins. Mr. Fletcher has also brought together a large collection of useful grasses and has succeeded in establishing a series of experimental plots with the object of determining their hardiness and relative usefulness as fodder plants. This branch of his work has been much appreciated, the large number of letters of inquiry which have been received from year to year in connection with these several divisions of the work indicate the lively interest which is taken in them.

In July, 1887, Mr. F. T. Shutt, was appointed as Chemist to the Dominion experimental farms, which prepared the way for supplying some portion of the information needed in connection with the chemistry of agriculture. Shortly after his appointment Mr. Shutt accompanied the Director in a visit paid to several of the well known chemical laboratories in the United States, and by this means much useful information was accumulated and from the data obtained the size and form of the present laboratories were determined and the plans for the building prepared. While this structure was in course of erection Mr. Shutt proceeded to Europe and visited some of the more important laboratories in Great Britain and on the continent, and selected the necessary apparatus for the laboratory at Ottawa. On his return plans of the internal fittings were prepared and carried out, and as a result of this arrangement the chemical laboratory at the experimental farm has been made one of the most convenient and best fitted establishments for carrying on chemical work in relation to agriculture to be found in this country. The good work since accomplished by Mr. Shutt in the analysis of soils, fodder plants, natural fertilizers, such as muds, marls and mucks from many parts of the Dominion, also grasses, sugar-beets and many other substances have made his annual reports very valuable to the farming community.

During 1887 and 1888 the clearing of the land on the Central Experimental Farm was completed, the main drains and many of the branches measuring over fifteen miles in all were laid, most of the buildings planned and erected, avenues, ornamental hedges and clumps of shrubbery were planted, the land adjacent to the buildings graded and sodded and the whole aspect of the farm greatly improved. Extensive shelter belts and plantations of forest trees have since been planted which will eventually add much to the beauty of the place.

In May, 1888, experiments were begun with poultry and the services of Mr. A. G. Gilbert secured to carry on this work. Later in the season when the poultry building was ready for occupation, the birds which had been bred served to furnish it with stock and Mr. Gilbert was selected to fill the position of Poultry Manager. The annual reports he has given of the work carried on have been of much service

to those interested in poultry and have served as a guide to many in the management of fowls as well as in the selection of varieties.

On the 1st February, 1890, Mr. Jas. W. Robertson was appointed as Agriculturist to the Experimental Farm and Dairy Commissioner for the Dominion. In his capacity as agriculturist he has taken charge of the stock, originated the many important feeding tests which have been made and supervised the work. The dairy building and piggery were built in accordance with plans prepared by him and embody modern conveniences which simplify and lessen the work. In these buildings continued experiments have been carried on in connection with the manufacture of butter and the feeding of cattle and swine, and important bulletins and reports published on these subjects. Owing to Mr. Robertson's frequent and unavoidable absence in pursuance of his other duties, a part of the work which usually devolves on the agriculturist has been carried on by the Director aided by the farm foreman and by Mr. Wm. Macoun, who discharges the duty of foreman of forestry and assistant in experimental work. The important work carried on by Mr. Robertson as Dairy Commissioner for the Dominion has already influenced most favourably the dairy exports of this country and the stimulus which he has given to this industry by the establishment of experimental dairy stations and winter creameries, by his personal efforts and those of the Assistant Dairy Commissioner in Quebec, together with those of the instructors under his charge, will doubtless result in a still greater development of this extensive industry in every province of the Dominion. Full particulars of this work are given in the reports of the Dairy Commissioner.

In connection with the establishment and supervision of the experimental farms, the writer has travelled since October, 1886, eight times to the Pacific coast and ten times to the Atlantic, and visited a large proportion of the more important agricultural districts throughout the Dominion. In all branches of the work undertaken he has been greatly aided by the faithful services of those who have been associated with him and in charge of special departments and to the value of their work he desires to bear grateful testimony, and with their help these establishments have been brought to their present position of usefulness and popularity.

DISTRIBUTION OF SEED GRAIN.

Under instructions of the Hon. Minister of Agriculture this useful department of work has been continued and a very large number of requests from farmers complied with. Some of the more valuable varieties of grain distributed in sample bags among farmers for test during the past three or four years are now becoming the leading sorts in cultivation in many districts and are resulting in increased and more profitable crops.

The samples sent out during the early months of 1892, were distributed as follows:

Prince Edward Island.

Wheat	93
Oats	83
Barley	68
Pease	10
Indian corn	31
Potatoes	19
	304

Number of applicants supplied, 134.

Nova Scotia.

Oats	376
Barley	260
Wheat	204
Pease	20
Potatoes	100
Indian corn	60
	1,020

Number of applicants supplied, 552.

New Brunswick.

Oats	263
Wheat	193
Barley	189
Pease	40
Spring rye	6
Indian corn	446
Potatoes	88
	1,225

Number of applicants supplied, 759.

Ontario.

Oats	1,302
Wheat	936
Barley	890
Pease	192
Spring rye	10
Indian corn	200
Potatoes	104
	3,634

Number of applicants supplied, 1,547.

Quebec.

Oats	2,554
Barley	2,001
Wheat	1,960
Pease	396
Spring rye	2
Potatoes	939
Indian corn	665
	8,517

Number of applicants supplied, 5,282.

Manitoba.

Oats	280
Wheat	204
Barley	178
Pease	16
Potatoes	16
Indian corn	12
	706

Number of applicants supplied, 305.

North-west Territories.

Oats	351
Barley	263
Wheat	212
Pease	37
Spring rye	18
Indian corn	43
Potatoes	9
	933

Number of applicants supplied, 350.

British Columbia.

Oats	175
Wheat	152
Barley	140
Pease	8
Indian corn	88
Potatoes	3
	566

Number of applicants supplied, 185.

The following list shows the number of three-pound packages of the different varieties which have been distributed:—

Oats.

Banner	2,123
Prize Cluster	1,226
Flying Scotchman	739
Royal Doncaster	451
Bonanza	348
Holstein prolific	232
Rosedale	217
Black Tartarian	48
	5,384

Wheat.

Campbell's white chaff	2,002
Ladoga	913
Judket	299
Red Fife	188
Rio Grande	186
Red Connell	169
Johnston's Defiance	169
Indian Hard Calcutta	27
Red Fern	1
	3,954

Barley—Two-rowed.

Kinver Chevalier	1,694
Goldthorpe	1,558
Prize Prolific	310
Saale	233
	3,795

Barley—Six-rowed.

Baxter's Six-rowed	159
Rennie's Improved	35
	194

Pease.

Mummy	393
Pride	197
Multiplier	50
Black Marrowfat	49
White Marrowfat	30
	719

Rye.

Spring rye	36

Indian Corn.

Pearce's Prolific	720
Rural Thoroughbred White Flint	714
Longfellow	94
Mitchell's Early	17
	1,545

Potatoes.

Early Ohio	324
Lee's Favourite	234
Algoma Seedling No. 2	130
Wonder of the World	120
Daisy	120
Thorburn	92
May Queen	74
Chicago Market	66
Beauty of Hebron	52
Early Sunrise	32
Holborn Abundance	28
Rural Blush	6
	1,278
Total number of samples distributed	16,905
Number of applicants supplied	9,114

REPORTS RECEIVED FROM SAMPLES DISTRIBUTED.

Banner Oats.

Prince Edward Island.—Number of reports received, 5; average yield from 3 lbs., 106½ lbs.; average weight per bushel, 36 lbs. The largest crop was 168 lbs., grown by J. A. Gallant, of Fifteen Point, and weighed 37 lbs. per bushel. The heaviest sample received from this province was grown by P. Chiasson, of Tignish, and weighed 41¼ lbs. per bushel.

Nova Scotia.—Number of reports received, 33; average yield from 3 lbs., 53½ lbs.; average weight per bushel, 33¾ lbs. The largest crop was 90 lbs., grown by R. McNeill, of Big Beach, no sample was received. The heaviest sample received from this province was grown by Neil McNeill, of Shubenacadie, and weighed 38½ lbs. per bushel.

New Brunswick.—Number of reports received, 29; average yield from 3 lbs., 64⅓ lbs.; average weight per bushel, 34⅓. The largest crop was 127 lbs., grown by J. R. Taylor, of Roekland, no sample was received. The heaviest sample was grown by A. McKay, of Kincardine, and weighed 38 lbs. per bushel.

Quebec.—Number of reports received, 159; average yield from 3 lbs., 63¼ lbs.; average weight per bushel, 33¾ lbs. The largest crop was 210lbs., grown by N. Dupont, sen., St. Sévère, and weighed 33 lbs. per bushel. The heaviest sample received from this province was grown by I. Lortie, of Ste. Justine de Newton, and weighed 41¾ lbs. per bushel.

Ontario.—Number of reports received, 44; average yield from 3 lbs., 72; average weight per bushel, 33¼ lbs. The largest crop was 170 lbs., grown by H. Allard, of Nosbonsing, and weighed 36½ lbs. per bushel. The heaviest sample received from this province was grown by J. P. Bradshaw, of Bar River, and weighed 38¾ lbs. per bushel.

Manitoba.—Number of reports received, 13; average yield from 3 lbs., 67 lbs.; average weight per bushel, 34½ lbs. The largest crop was 142 lbs., grown by A. J. Cotton, of Treherne, and weighed 35 lbs. per bushel. The heaviest sample received from this province was grown by J. Connor, of Mowbray, and weighed 39¼ lbs. per bushel.

North-west Territories.—Number of reports received, 7; average yield from 3 lbs., 50 lbs.; average weight per bushel, 37 lbs. The largest crop was 98 lbs., grown by H. Harris of Yorkton, he also had the heaviest sample weighing 39¼ lbs. per bushel.

British Columbia.—Number of reports received, 13; average yield from 3 lbs. 109⅓ lbs.; average weight per bushel, 37½ lbs. The largest crop was 360 lbs., grown by T. G. McCormick, of Vernon, but no sample of this was received. The heaviest sample received was grown by D. Matheson, of Spallmacheen, and weighed 41 lbs. per bushel.

Prize Cluster Oats.

Prince Edward Island.—Number of reports received, 5; average yield from 3 lbs., 63½ lbs.; average weight per bushel, 39¼ lbs. The largest crop was 83 lbs. grown by S. Dawson of Quyon, and weighed 36 lbs. per bushel. The heaviest sample was grown by J. T. Pickering, of Stanley Bridge, and weighed 43½ lbs. per bushel.

Nova Scotia.—Number of reports received, 12; average yield from 3 lbs. 46¾ lbs.; average weight per bushel, 38 lbs. The largest crop was 92 lbs., grown by J. Slade, of Tatamagouche. This was, also, the heaviest sample received and weighed 40¾ lbs. per bushel.

New Brunswick.—Number of reports received, 22; average yield from 3 lbs., 61 lbs.; average weight per bushel, 39½ lbs. The largest crop was 159 lbs. grown by W. Cunningham of Upper Caverhill and weighed 39½ lbs. per bushel. The heaviest sample was grown by H. H. Chiasson, of St. Louis de Kent, and weighed 43¾ lbs. per bushel.

Quebec.—Number of reports received, 93; average yield from 3 lbs., 63¾ lbs.; average weight per bushel, 38¼ lbs. The largest crop was 200 lbs., grown by A. St. Onge of Bécancour, and weighed 29½ lbs. per bushel. The heaviest sample was grown by P. Soucy, of St. Léon de Stanton, and weighed 44 lbs. per bushel.

Ontario.—Number of reports received, 51; average yield from 3 lbs., 62½ lbs.; average weight per bushel, 38⅓ lbs. The largest crop was 130 lbs., grown by M. Waniker, of Round Lake, and weighed 40 lbs. per bushel. The heaviest sample was grown by E. Wright, of Lindsay, and weighed 42½ lbs. per bushel.

Manitoba.—Number of reports received, 8; average yield from 3 lbs., 42 lbs.; average weight per bushel, 40½ lbs. The largest crop was 63 lbs., grown by A. Lundgrew of Scandinavia, and weighed 42 lbs. per bushel. This was also the heaviest sample received from Manitoba.

North-west Territories.—Number of reports received, 5; average yield from 3 lbs., 27 lbs.; average weight per bushel, 37½ lbs. The largest crop was 40 lbs., grown by F. Nicholson, of Perley, and weighed 39¾ lbs. per bushel. The heaviest sample was grown by R. Smith & Son, of Prince Albert, and weighed 40¼ lbs.

British Columbia.—Number of reports received, 5; average yield from 3 lbs., 57½ lbs.; average weight per bushel, 41¼ lbs. The largest crop was 100 lbs., grown by T. Degnen of Gabriolia Island, and weighed 44¼ lbs. per bushel; this was also the heaviest sample received.

Flying Scotchman Oats.

Prince Edward Island.—Number of reports received, 3; average yield from 3 lbs., 51⅔ lbs.; average weight per bushel, 38 lbs. The largest crop was 68 lbs., grown by A. A. Moore, of Pownall, and weighed 39½ lbs. per bushel. This was the heaviest sample received from this province.

Nova Scotia.—Number of reports received, 6; average yield from 3 lbs., 61¾ lbs.; average weight per bushel, 35 lbs. The largest crop was 104 lbs., grown by Robt. Smith, of Pugwash, and weighed 38 lbs. per bushel. This was also the heaviest sample received from this province.

New Brunswick.—Number of reports received, 9; average yield from 3 lbs., 66⅔ lbs.; average weight per bushel, 36¾ lbs. The largest crop was 92 lbs., grown by I. J. Brown, of Canterbury Station, and weighed 34¾ lbs. per bushel. The heaviest sample received from this province was grown by M. Dugas, of Grande Anse, and weighed 39½ lbs. per bushel.

Quebec.—Number of reports received, 46; average yield from 3 lbs., 61¾ lbs.; average weight per bushel, 35¾ lbs. The largest crop was 171 lbs., grown by D.

Gaudette, of Joliette, and weighed 31½ lbs. per bushel. The heaviest sample received from this province was grown by H. Vincent, of St. Canute, and weighed 40½ lbs. per bushel.

Ontario.—Number of reports received, 29; average yield from 3 lbs., 77¼ lbs.; average weight per bushel, 37 lbs. The largest crop was 138 lbs., grown by Wm. Kirk of Paisley, and weighed 37½ lbs. per bushel. The heaviest sample received from this province was grown by Jas. Bates, of North Glanford, and weighed 40½ lbs. per bushel.

Manitoba.—Number of reports received, 5; average yield from 3 lbs., 76½ lbs.; average weight per bushel, 36 lbs. The largest crop was 110 lbs., grown by John Gowell, of Carberry, no sample received. The heaviest sample received from this province was grown by A. Lundgrew, of Scandinavia, and weighed 39¾ lbs. per bushel.

North-west Territories.—Number of reports received, 6; average yield from 3 lbs., 43½ lbs.; average weight per bushel, 36½ lbs. The largest crop was 52 lbs., grown by F. J. Houghton, of Cannington Manor, and weighed 35 lbs. per bushel. The heaviest sample received from the Territories was grown by B. Harvey, of Saltcoats, and weighed 41 lbs. per bushel.

British Columbia.—Number of reports received, 2; average yield from 3 lbs., 67 lbs.; average weight per bushel, 38 lbs. The largest crop was 100 lbs., grown by J. R. Grey, of Langley. No sample was received. The heaviest sample received from this province was grown by Wm. Issae, of Port Hammond, and weighed 38 lbs. per bushel.

Royal Doncaster Oats.

Prince Edward Island.—Number of reports received, 2; average yield from 3 lbs., 47½ lbs.; average weight per bushel, 35 lbs. The largest crop was 55 lbs., grown by H. McQueen, of Orwell, who also had the heaviest sample, weighing 37¼ lbs. per bushel.

Nova Scotia.—Number of reports received, 5; average yield from 3 lbs., 47½ lbs.; average weight per bushel, 35¼ lbs. The largest crop was 55 lbs., grown by J. Cummings, of Pugwash, and weighed 37 lbs. per bushel. The heaviest sample was grown by Donald McRae, of Baddeck, and weighed 38 lbs. per bushel.

New Brunswick.—Number of reports received, 6; average yield from 3 lbs., 51 lbs.,; average weight per bushel, 39 lbs. The largest crop was 106 lbs., grown by by Mr. Cyr, of St. Leonard, and weighed 40 lbs. per bushel. The heaviest sample was grown by J. Findlay, of Upper Kintore, and weighed 41 lbs. per bushel.

Quebec.—Number of reports received, 16; average yield from 3 lbs., 58½ lbs.; average weight per bushel, 36¼ lbs. The largest crop was 108 lbs., grown by J. Parent, of Charlesbourg, and weighed 34½ lbs. per bushel. The heaviest sample was grown by A. Lachance, of Sacré Cœur de Marie, and weighed 40½ lbs. per bushel.

Ontario.—Number of reports received, 15; average yield from 3 lbs., 70 lbs., average weight per bushel 36 lbs. The largest crop was 125 lbs., grown by T. Manderson of Myrtle and weighed 35¼ lbs. per bushel. The heaviest sample was grown by W. Merkley of Irena and weighed 40 lbs. per bushel.

Manitoba.—Number of reports received, 4; average yield from 3 lbs., 72¼ lbs., average weight per bushel, 32¾ lbs. The largest crop was 78 lbs., grown by B. Prefontaine of St. Eustache and weighed 31 lbs. per bushel. The heaviest sample was grown by J. Barclay of Morris and weighed 36 lbs. per bushel.

North-west Territories.—No reports yet received.

British Columbia.—Number of reports received 2, only one of these gave the yield, from 3 lbs., 28½ lbs., this was grown by J. M. Webster of Webster's Corners and weighed 38½ lbs. per bushel.

Bonanza Oats.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 65 lbs.; average weight per bushel, 40¾ lbs. The largest crop was 88 lbs., grown by H. Duthie of Kincardine. This also was the heaviest sample, and weighed 43½ lbs. per bushel.

Quebec.—Number of reports received, 26; average yield from 3 lbs., 57½ lbs.; average weight per bushel 39¾ lbs. The largest crop was 120 lbs. grown by F. Bolduc of St. Henri, and weighed 39 lbs. per bushel. The heaviest sample was grown by A. Vaillancourt of Ste. Perpetue, and weighed 46¼ lbs. per bushel.

Ontario.—Number of reports received, 9; average yield from 3 lbs., 54 lbs.; average weight per bushel, 38¾ lbs. The largest crop was 96 lbs., grown by C. Jones of Hillier, and weighed 40 lbs. per bushel. The heaviest sample was grown by J. Russell of Eady, and weighed 40¼ lbs. per bushel.

British Columbia.—One report received; yield from 3 lbs., 115 lbs.; weight per bushel 45 pounds, grown by W. Brown of Somenos.

Holstein Prolific.

Nova Scotia.—Number of reports received, 2; only one of which gives the yield; this was grown by S. Robichaud of Meteghan, and the yield from 3 lbs. was 64 lbs.; weight per bushel, 30 lbs. The other sample weighed 35 lbs. per bushel, and was grown by J. McKenzie of Rear Baddeck Bay.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 56½ lbs.; average weight per bushel, 32½ lbs. The largest crop was 65 lbs., grown by D. Parent of Upper Queensland, and weighed 30½ lbs. per bushel. The heaviest sample was grown by J. Ellis of New Kincardine, and weighed 34 lbs. per bushel.

Quebec.—Number of reports received, 6; average yield from 3 lbs., 71½ lbs.; average weight per bushel, 34¾ lbs. The largest crop was 100 lbs., grown by G. Gagné of Maria, and weighed 34 lbs. per bushel. The heaviest sample was grown by A. LeBellois, of Magnosha, and weighed 38½ lbs. per bushel.

Ontario.—Number of samples received, 18; average yield from 3 lbs., 83 lbs.; average weight per bushel, 32¼ lbs. The largest crop was 130 lbs., grown by J. Keffer, of Ethel; sample sent was too small to weigh. The heaviest sample was grown by P. McGregor, of Rokeby, and weighed 38¼ lbs. per bushel.

Rosedale.

Prince Edward Island.—One report only was received, the yield was 79 lbs., from 3 lbs. of seed, weighing 37 lbs. per bushel; grown by E. Bearisto, of Montrose.

Quebec.—Number of reports received, 8; average yield from 3 lbs., 44½ lbs.; average weight per bushel, 38¾ lbs. The largest crop was 89 lbs., grown by N. Lambert, of St. Didace, who also had the heaviest sample, weighing 40½ lbs. per bushel.

Ontario.—Number of reports received, 12; average yield from 3 lbs., 52½ lbs.; average weight per bushel, 32½ lbs. The largest crop was 88 lbs., grown by T. Teasdale, of Concord, and weighed 33½ lbs. per bushel. The heaviest sample was grown by Wm. Stillman, of Campbellford, and weighed 39 lbs. per bushel.

Manitoba.—Number of reports received, 3; average yield from 3 lbs., 103 lbs.; average weight per bushel, 36¾ lbs. The largest crop was 130 lbs., grown by A. J. Cotton of Treherne, and weighed 35½ lbs. per bushel. The heaviest sample was grown by A. Dixon, of Dugald, and weighed 38 lbs. per bushel.

Black Tartarian.

Nova Scotia.—Number of reports received, 3; average yield from 3 lbs., 38⅓ lbs.; average weight per bushel, 29¾ lbs. The largest crop was 96 lbs., grown by F. Beaton, of Alexander, and weighed 32¾ lbs. per bushel; he also had the heaviest sample.

Ontario.—One report was received from Ontario, from R. S. Jones, of Hillier, who had a crop of 112 lbs. from 3 lbs. of seed, which weighed 33¾ lbs. per bushel.

Manitoba.—Number of reports received, 2; average yield from 3 lbs., 41 lbs.; average weight per bushel, 34¼. The largest crop was 65 lbs., grown by Wm. Allison, of Starbuck, and weighed 31½ lbs. per bushel. The heaviest sample was grown by T. Seaman, of Seamo, and weighed 37 lbs. per bushel.

WHEAT.

Campbell's White Chaff.

Prince Edward Island.—Number of reports received, 13; average yield from 3 lbs., 51½ lbs.; average weight per bushel, 58¾ lbs. The largest crop was 100 lbs., grown by J. A. Gallant, of Fifteen Point; the heaviest sample was grown by A. McLean, of Beaton's Mills, and weighed 60½ lbs. per bushel.

New Brunswick.—Number of reports received, 27; average yield from 3 lbs., 54 lbs.; average weight per bushel, 59 lbs. The largest yield was 120 lbs., grown by T. Watt, of Kintore, and weighed 53¼ lbs. per bushel; the heaviest sample was grown by J. Paterson, of Upper Kintore, and weighed 63 lbs. per bushel.

Nova Scotia.—Number of reports received, 19; average yield from 3 lbs., 45¾ lbs.; average weight per bushel, 58½ lbs. The largest crop was 91 lbs., grown by J. Killam, of Kingston, and weighed 56 lbs. per bushel; the heaviest sample was grown by J. A. Cummings, of Pugwash, and weighed 62 lbs. per bushel.

Quebec.—Number of reports received, 119; average yield from 3 lbs., 41¼ lbs; average weight per bushel, 57 lbs. The largest crop was 162 lbs., grown by T. Tremblay, of Hebertville. He also had the heaviest sample, weighing 62½ per bushel.

Ontario.—Number of reports reeeived, 85; average yield from 3 lbs., 34½ lbs.; average weight per bushel, 55¾ lbs. The largest crop was 132 lbs., grown by Wm. Hawkins of Micksburg, and weighed 59½ lbs. per bushel. The heaviest sample was grown by A. H. Hogan, of Sowerby, and weighed 61 lbs. per bushel.

Manitoba.—Number of reports received, 4; average yield from 3 lbs., 27½ lbs.; average weight per bushel, 58½ lbs. The largest crop was 35 lbs., grown by I. Plamondon, of St. Jean-Baptiste, and weighed 53¼ lbs. per bushel. The heaviest sample was grown by A. Ferguson, of Virden, and weighed 61¾ lbs. per bushel.

North-west Territories.—Number of reports received, 3; average yield from 3 lbs., 27½ lbs.; average weight per bushel, 58½ lbs. The largest crop was 40 lbs., grown by C. Davis, of Whitewood, and weighed 60 lbs. per bushel, being the heaviest sample received.

British Columbia.—Number of reports received, 15; average yield from 3 lbs., 90 lbs.; average weight per bushel, 58½ lbs. The largest crop was 350 lbs., grown by D. Matheson, of Spallumcheen, and weighed 62¾ lbs. per bushel. The heaviest sample received was grown by O. Rentz, of French Creek, and weighed 63¼ lbs. per bushel.

Ladoga Wheat.

Prince Edward Island.—Number of reports received, 2; average yield from 3 lbs., 25½ lbs.; average weight per bushel, 60 lbs. The largest crop was 26 lbs., grown by A. McMillan, of Long Point, and weighed 60½ lbs. per bushel, being the heaviest sample received.

Nova Scotia.—Number of reports received, 7; average yield from 3 lbs., 29¾ lbs.; average weight per bushel, 58 lbs. The largest crop was 40 lbs., grown by J. J. McCharles, of South Gut, and weighed 57 lbs. per bushel. The heaviest sample was grown by D. McLennan, of South Bar, and weighed 60¾ lbs. per bushel.

New Brunswick.—Number of reports reeeived, 7; average yield from 3 lbs., 43½ lbs.; average weight per bushel, 59¼ lbs. The largest crop was 60 lbs., grown by B. A. Chapman, of Coeagne Bridge, and weighed 61½ lbs. per bushel, being the heaviest sample reeeived.

Quebec.—Number of reports reeeived, 74; average yield from 3 lbs., 44 lbs.; average weight per bushel, 57¼ lbs. The largest crop was 96 lbs., grown by W. Vallier, of Agnes, and weighed 57 lbs. per bushel. The heaviest sample was grown by J. Briere, of St. Charles de Caplan, and weighed 62¾ lbs. per bushel.

Ontario.—Number of reports received, 7; average yield from 3 lbs., 37½ lbs.; average weight per bushel, 58½ lbs. The largest crop was 75 lbs., grown by G. Reid, of Bar River, and weighed 60 lbs. per bushel. The heaviest sample was grown by T. Ledstone, of Bar River, and weighed 63 lbs. per bushel.

Manitoba.—Number of reports received, 4; average yield from 3 lbs., 42 lbs.; average weight per bushel, 59½ lbs. The largest crop was 63 lbs., grown by R. H. Cathelineau, of Giroux; no sample received. The heaviest sample was grown by W. T. Bett, of Seamo, and weighed 60¼ lbs. per bushel.

North-west Territories.—Number of reports received, 4; average yield from 3 lbs., 32 lbs.; average weight per bushel, 54½ lbs. The largest crop was 57 lbs, grown by J. Cole, of Red Deer, and weighed 56¾ lbs per bushel, being the heaviest sample received.

British Columbia.—Number of reports received, 1; yield from 3 lbs., 185 lbs.; weight per bushel, 63½ lbs. Grown by J. H. Chapman, of Chilliwack, B.C.

Judket.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 27 lbs.; weight per bushel, 58½ lbs. Grown by E. Bearisto, of Montrose.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs., 54 lbs.; weight per bushel, 58½ lbs. Grown by D. W. McFarland, of Wallace.

New Brunswick—Number of reports received, 1; yield from 3 lbs., 25 lbs.; weight per bushel, 60¼ lbs. Grown by L. Gosselin, of Sweeneyville.

Quebec.—Number of reports received, 24; average yield from 3 lbs., 44½ lbs.; average weight per bushel, 57 lbs. The largest crop was 81 lbs., grown by G. St. Amand, of St. Joseph de LePage; no sample received. The heaviest sample was grown by G. Sutherland, of L'Avenir, and weighed 60¾ lbs. per bushel.

Ontario.—Number of reports received, 9; average yield from 3 lbs., 25½ lbs.; average weight per bushel, 57¾ lbs. The largest crop was 47 lbs., grown by J. Bradshaw, of Bar River, Ont., and weighed 58½ lbs. per bushel. The heaviest sample was grown by C. Ouellette, of Eastman's Springs, and weighed 59 lbs. per bushel.

Manitoba.—Number of reports received, 7; average yield from 3 lbs., 50 lbs.; average weight per bushel, 58 lbs. The largest crop was 75 lbs., grown by A. Cotton, of Treherne, and weighed 60 lbs. per bushel, being the heaviest sample received.

Red Fife.

Prince Edward Island.—No reports received.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs., 46 lbs.; weight per bushel, 59¾ lbs. Grown by A. J. Cummings, of Pugwash.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 47 lbs.; weight per bushel of one sample received, 62¾ lbs. The largest crop was 61¼ lbs., grown by H. Duthie, of Kincardine. No sample received. The heaviest sample was grown by J. Cannon, of Upper Kintore, and weighed 62¾ lbs. per bushel.

Quebec.—Number of reports received, 7; average yield from 3 lbs., 70½ lbs.; average weight per bushel, 60¼ lbs. The largest crop was 160 lbs., grown by the Trappist Fathers of Oka, and weighed 57¾ lbs. per bushel. The heaviest sample was grown by G. Whetton, of Paspebiac, and weighed 62¼ lbs. per bushel.

Ontario.—Number of reports received, 1; yield from 3 lbs., 30 lbs.; weight per bushel, 57¼ lbs. Grown by T. Boucher, of St. Thomas.

Manitoba.—Number of reports received, 9; average yield from 3 lbs., 52⅓ lbs.; average weight per bushel, 59½ lbs. The largest crop was 125½ lbs., grown by A. V. Brunker, of St. Jean Baptiste, and weighed 61¼ lbs. per bushel. The heaviest sample was grown by Z. Gaudbout, of Carleton West, and weighed 63 lbs. per bushel.

Rio Grande.

Prince Edward Island.—Number of reports received, 2; average yield from 3 lbs., 39 lbs.; average weight per bushel, 60¼ lbs. The largest crop was 44 lbs., grown by A. A. Moore, of Pownall, and weighed 60 lbs. per bushel. The heaviest sample was grown by N. McDonald, of Hampton, and weighed 60½ lbs. per bushel.

Nova Scotia.—Number of reports received, 3; average yield from 3 lbs., 28 lbs.; average weight per bushel, 59 lbs. The largest crop was 30 lbs., grown by M. McGillis, of North Gut, St. Ann's, and weighed 60¼ lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 24 lbs.; average weight per bushel, 64½ lbs. The largest crop was 25 lbs., grown by T. Bobineau, of Cocagne. No sample received. The heaviest sample was grown by C. L. Cogan, of Cocagne River, and weighed 64½ lbs. per bushel.

Quebec.—Number of reports received, 11; average yield from 3 lbs., 39½ lbs.; average weight per bushel, 59½ lbs. The largest crop was 75 lbs., grown by A. Hebert, of St. Félicien, and weighed 60 lbs. per bushel. The heaviest sample was grown by A. Houde, of Baie St. Paul, and weighed 62 lbs. per bushel.

Ontario.—Number of reports received, 8; average yield from 3 lbs., 25 lbs.; average weight per bushel, 59¼ lbs. The largest crop was 47 lbs., grown by N. Colville, of Leskard, Ont., and weighed 60¾ lbs., per bushel. The heaviest sample was grown by W. S. Bain, of Beaverton, and weighed 61 lbs. per bushel.

Manitoba.—Number of reports received, 2; average yield from 3 lbs., 35 lbs., average weight per bushel, 61½ lbs. The largest crop was 35 lbs., grown by J. Plamondon, of St. Jean-Baptiste, and weighed 61½ lbs. per bushel, being the heaviest sample received.

Red Connell.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 75 lbs., average weight per bushel, 56½ lbs. The largest crop was 114 lbs., grown by Thos. Watt, of Kintore, and weighed 53¾ lbs. per bushel. The heaviest sample was grown by D. A. Gognem, of Cocagne River, and weighed 59 lbs. per bushel.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 46 lbs.; average weight per bushel, 59¼ lbs. The largest crop was 52 lbs., grown by A. Boldt, of Kinmount, and weighed 59¼ lbs. per bushel, being the heaviest sample received.

North-west Territories.—Number of reports received, 1; yield from 3 lbs., 40 lbs. weight per bushel, 59½ lbs. Grown by B. Harvey, of Saltcoats.

Johnston's Defiance.

New Brunswick.—Number of reports received, 1; yield from 3 lbs, 54 lbs.; weight per bushel, 58½ lbs. Grown by M. Cyr, of St. Leonard.

Quebec.—Number of reports received, 14; average yield from 3 lbs, 39⅓ lbs., average weight per bushel, 57 lbs. The largest crop was 87 lbs., grown by N. Dupont (père) of St. Sévère, and weighed 62½ lbs. per bushel, being the heaviest sample received.

Indian Hard Calcutta.

Manitoba.—Number of reports received, 1; yield from 3 lbs, 45 lbs.; weight per bushel, 60¼ lbs. Grown by J. T. Barclay, of Morris.

BARLEY.

Kinver Chevalier.

Prince Edward Island.—Number of reports received, 7; average yield from 3 lbs., 55 lbs.; average weight per bushel, 48½ lbs. The largest crop was 80 lbs., grown by W. Clark, of North Wiltshire, and weighed 49½ lbs. per bushel. The heaviest sample was grown by J. T. Pickering, of Stanley Bridge, and weighed 51¾ lbs. per bushel.

Nova Scotia.—Number of reports received, 10; average yield from 3 lbs., 44½ lbs.; average weight per bushel, 48½ lbs. The largest crop was 53 lbs., grown by J. J. Hern, of Grande Anse, and weighed 53 lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 8; average yield from 3 lbs., 36½ lbs.; average weight per bushel, 48 lbs. The largest crop was 49 lbs., grown by P. Machray, of Kintore, and weighed 50¼ lbs. per bushel. The heaviest sample was grown by L. Gosselin, of Sweeneyville, and weighed 53 lbs. per bushel.

Quebec.—Number of reports received, 107; average yield from 3 lbs., 39 lbs.; average weight per bushel, 45¼ lbs. The largest crop was 130 lbs., grown by H. Legault (Maire), of St. Geneviève, and weighed 48¾ lbs. per bushel. The heaviest sample was grown by A. Labillois, of St. Jean l'Evangéliste, and weighed 53 lbs. per bushel.

Ontario.—Number of reports received, 29; average yield from 3 lbs., 41½ lbs.; average weight per bushel, 48 lbs. The largest crop was 145 lbs., grown by J. Renwick, of Lakehurst, and weighed 49 lbs. per bushel. The heaviest sample was grown by Wm. Stillman, of Campbellford, and weighed 52 lbs. per bushel.

Manitoba.—Number of reports received, 10; average yield from 3 lbs., 46 lbs.; average weight per bushel, 50¾ lbs. The largest crop was 73 lbs., grown by A. J. Cotton, of Treherne, and weighed 49¾ lbs. per bushel. The heaviest sample was grown by S. Finnegan, of Bonnie Doon, and weighed 53 lbs. per bushel.

North-west Territories.—Number of reports received, 6; average yield from 3 lbs., 40 lbs.; average weight per bushel, 49 lbs. The largest crop was 50 lbs., grown by C. Davis, of Whitewood, and weighed 53½ lbs. per bushel, being the heaviest sample received.

British Columbia.—Number of reports received, 7; average yield from 3 lbs., 64 lbs.; average weight per bushel, 50 lbs. The largest crop was 98 lbs., grown by J. McConnell, of Chilliwack, and weighed 50¾ lbs. per bushel. The heaviest sample was grown by A. Debeault, of Alberni, and weighed 52¼ lbs. per bushel.

Goldthorpe.

Prince Edward Island.—Number of reports received, 4; average yield from 3 lbs., 39¼ lbs.; average weight per bushel, 49¼ lbs. The largest crop was 60 lbs., grown by W. H. Cread, of Sturgeon, and weighed 50½ lbs. per bushel, being the heaviest sample received.

Nova Scotia.—Number of reports received, 10; average yield from 3 lbs., 46½ lbs; average weight per bushel, 47¾ lbs. The largest crop was 116 lbs, grown by R. Smith, of Pugwash, and weighed 46¼ lbs per bushel. The heaviest sample was grown by F. Collins, of McLennan's Mountain, and weighed 52 lbs. per bushel.

New Brunswick.—Number of reports received, 15; average yield from 3 lbs., 41¾ lbs.; average weight per bushel, 50½ lbs. The largest crop was 88 lbs., grown by J. R. Taylor, of Rockland, and weighed 53½ lbs. per bushel. The heaviest sample was grown by A Philip, of Upper Kintore, and weighed 53¾ lbs. per bushel.

Quebec.—Number of reports received, 56; average yield from 3 lbs., 45¾ lbs.; average weight per bushel, 47 lbs. The largest crop was 108 lbs., grown by J. Dumais, of Baie des Pères, and weighed 51 lbs. per bushel. The heaviest sample was grown by J. Bte. Rossignol, of St. Louis, Lake St. John, and weighed 53¼ lbs. per bushel.

Ontario.—Number of reports received, 55; average yield from 3 lbs., 42¾ lbs.; average weight per bushel, 47½ lbs. The largest crop was 115 lbs., grown by Jas. Exon, of Haliburton, and weighed 50¼ lbs. per bushel. The heaviest sample was grown by Wm. Stillman, of Campbellford, and weighed 53¼ lbs. per bushel.

Manitoba.—Number of reports received, 10; average yield from 3 lbs., 56½ lbs.; average weight per bushel, 49½ lbs. The largest crop was 100 lbs., grown by J. Charles, of Oak Lake, and weighed 52 lbs. per bushel. The heaviest sample was grown by D. Chalmers, of Richland, and weighed 52½ lbs. per bushel.

North-west Territories.—Number of reports received, 5; average yield from 3 lbs., 84½ lbs.; average weight per bushel, 50 lbs. The largest crop was 102 lbs., grown by J. Newhart, of Fort Saskatchewan, and weighed 52 lbs. per bushel, being the heaviest sample received.

British Columbia.—Number of reports received, 9; average yield from 3 lbs., 51⅓ lbs.; average weight per bushel, 51¾ lbs. The largest crop was 96 lbs., grown

by W. C. Brown, of Somenos, and weighed 52 lbs. per bushel. The heaviest sample was grown by N. Gaetzen, of French Creek, and weighed 54 lbs. per bushel.

Prize Prolific.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 30 lbs.; weight per bushel, 49½ lbs. Grown by F. Gallant, of Cape Egmont.

Nova Scotia.—Number of reports received, 3; average yield from 3 lbs., 62 lbs.; average weight per bushel, 48½ lbs. The largest crop was 100 lbs., grown by J. Slade, of West Tatamagouche, and weighed 53¼ lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 4; average yield from 3 lbs., 22¼ lbs.; average weight per bushel, 43⅓ lbs. The largest crop was 40 lbs., grown by W. Cunningham, of Upper Caverhill, and weighed 42½ lbs. per bushel. The heaviest sample was grown by A. Brown, of Corn Hill, and weighed 44¾ lbs. per bushel.

Quebec.—Number of reports received, 23; average yield from 3 lbs., 34½ lbs.; average weight per bushel, 46½ lbs. The largest crop was 72 lbs., grown by M. Girard, of St. Jean de Matha, and weighed 48 lbs. per bushel. The heaviest sample was grown by W. Cascadden, of Asbestos, and weighed 51½ lbs. per bushel.

Ontario.—Number of reports received, 4; average yield from 3 lbs., 21½ lbs.; average weight per bushel, 46¼ lbs. The largest crop was 25 lbs., grown by W. A. McCartney, of Milton West, and weighed 49½ lbs. per bushel, being the heaviest sample received.

Manitoba.—Number of reports received, 1; yield from 3 lbs., 25 lbs.; weight per bushel, 49½ lbs. Grown by W. T. Bett, of Seamo.

No reports from North-west Territories or British Columbia.

Saale.

Nova Scotia.—Number of reports received, 2; average yield from 3 lbs., 53½ lbs.; average weight per bushel, 47¼ lbs. The largest crop was 80 lbs., grown by R. McNeill, of Big Beach, and weighed 45 lbs. per bushel. The heaviest sample was grown by J. McNeill, of Big Pond, and weighed 49½ lbs. per bushel.

Quebec.—Number of reports received, 18; average yield from 3 lbs., 49 lbs.; average weight per bushel, 47½ lbs. The largest crop was 90 lbs., grown by L. Dubue, of St. Isidore, and weighed 46¾ lbs. per bushel. The heaviest sample was grown by M. Tremblay, of St. Roch des Aulnais, and weighed 51½ lbs. per bushel.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 48 lbs.; average weight per bushel, 44 lbs. The largest crop was 81 lbs., grown by J. Simpson, of Waverley, and weighed 48¾ lbs. per bushel, being the heaviest sample received.

No reports received from the other provinces.

Baxter's Six-rowed.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 90 lbs.; weight per bushel, 49¾ lbs., grown by G. Lenkletter, of Cape Egmont.

Nova Scotia.—Number of reports received, 3; average yield from 3 lbs., 46⅔ lbs.; average weight per bushel, 48⅛ lbs. The largest crop was 60 lbs., grown by J. G. Duncanson, of Port Hood, and weighed 48¼ lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 1; yield from 3 lbs., 73 lbs.; weight per bushel, 46 lbs. Grown by R. Watson, of Gladstone.

Quebec.—Number of reports received, 11; average yield from 3 lbs., 48½ lbs.; average weight per bushel, 47½ lbs. The largest crop was 80 lbs., grown by T. H. Bourgeois, of St. Théodore de Chertsey, and weighed 48 lbs. per bushel. The heaviest sample was grown by C. Pelletier, of St. Octave, and weighed 51¼ lbs. per bushel.

Ontario.—Number of reports received, 4; average yield from 3 lbs., 71 lbs; average weight per bushel, 51 lbs. The largest crop was 100 lbs., grown by Thos.

Manderson, of Myrtle, and weighed 54 lbs. per bushel, being the heaviest sample received.

No reports received from the other provinces.

Rennie's Improved Six-rowed.

Quebec.—Number of reports received, 3; average yield from 3lbs., 60½ lbs.; average weight per bushel, 48⅔. The largest crop was 80 lbs., grown by A. Gerard, of St. Anselme, and weighed 48 lbs. per bushel. The heaviest sample was grown by P. Rossignol, of River du Loup, and weighed 50½ lbs. per bushel.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 53 lbs.; average weight per bushel, 49 lbs. The largest crop was 62½ lbs., grown by C. L. Jones, of Hillier, and weighed 48¼ lbs. per bushel. The heaviest sample was grown by B. Kelly, of Phelpstone, and weighed 49½ lbs. per bushel.

No reports received from the other provinces.

PEASE.

Mummy.

Nova Scotia.—Number of reports received, 2; average yield from 3 lbs., 26 lbs.; average weight per bushel, 66 lbs. The largest crop was 27 lbs., grown by D. McRay, of Upper Baddeck, and weighed 66 lbs. per bushel, being the heaviest sample received.

New Brunswick.—Number of reports received, 3; average yield from 3 lbs., 45½ lbs.; average weight per bushel, 65 lbs. The largest crop was 75½ lbs., grown by J. R. Taylor, of Rockland, and weighed 65½ lbs. per bushel. The heaviest sample was grown by A. Patterson, of Kincardine, and weighed 66¼ lbs. per bushel.

Quebec.—Number of reports received, 36; average yield from 3 lbs., 36½ lbs.; average weight per bushel, 65½ lbs. The largest crop was 95 lbs., grown by H. Legault (maire) of St. Geneviève, and weighed 65 lbs. per bushel. The heaviest sample was grown by A. Bombarbier, of Baie des Pères, and weighed 67 lbs. per bushel.

Ontario.—Number of reports received, 9; average yield from 3 lbs., 35⅛ lbs.; average weight per bushel, 65 lbs.; the largest crop was 65 lbs., grown by E. Richardson, of Millbrook, and weighed 65¼ lbs. per bushel. The heaviest sample was grown by J. DeLamorandier, of Killarney, and weighed 67 lbs. per bushel.

Manitoba.—Number of reports received, 1; yield from 3 lbs., 60 lbs.; weight per bushel, 65¾ lbs. Grown by J. Harrison, of Riverville.

No reports received from the other provinces.

Pride.

Quebec.—Number of reports received, 15; average yield from 3 lbs., 33¼ lbs.; average weight per bushel, 65 lbs. The largest crop was 70 lbs., grown by A. Leclair, of St. Pamphile, and weighed 66¼ lbs. per bushel. The heaviest sample was grown by M. Jean, of St. Simon de Rimouski, and weighed 67½ lbs. per bushel.

Ontario.—Number of reports received, 7; average yield from 3 lbs., 30½ lbs.; average weight per bushel, 62½ lbs. The largest crop was 31 lbs., grown by S. Rennie, of Milliken, and weighed 63½ lbs. per bushel, being the heaviest sample received.

No reports were received from the other provinces.

Multiplier.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 75½ lbs.; average weight per bushel, 64¾ lbs. The largest crop was 93 lbs., grown by W. G. Cunningham, of Upper Caverhill, and weighed 64½ lbs. per bushel. The heaviest sample was grown by J. J. Hern, of Grande Anse, and weighed 65 lbs. per bushel.

Quebec.—Number of reports received, 1; yield from 3 lbs., 12 lbs.; weight per bushel, 65¼ lbs. Grown by A. Ouellet, of St. Louis de Ha Ha.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 67 lbs.; average weight per bushel, 65 lbs. The largest crop was 70 lbs., grown by G. Morrison, of Strathavon, and weighed 65½ lbs. per bushel, being the heaviest sample received.

No reports were received from the other provinces.

Black-Eyed Marrowfat.

Quebec.—Number of reports received, 1; yield from 3 lbs. 15 lbs.; weight per bushel, 63¼ lbs., grown by T. Richard, of St. Octave.

POTATOES.

Early Ohio.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 50 lbs. Grown by C. Mayers, of Lake Verd.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs., 41 lbs. Grown by S. Gillis, of Frisk Meadow.

Quebec.—Number of reports received, 30; average yield from 3 lbs., 53⅕ lbs. The largest crop was 123 lbs., grown by Rev. J. Boulet, of St. Magloire.

Ontario.—Number of reports received, 3; average yield from 3 lbs., 62 lbs. The largest crop was 85 lbs., grown by P. J. Kyle, of Eastman's Springs.

Manitoba.—Number of reports received, 1; yield from 3 lbs., 45 lbs. Grown by V. Florentin, of Clairier.

North-west Territories.—Number of reports received, 1; yield from 3 lbs., 12 lbs. Grown by T. Laidlaw, of Rathburn.

Lee's Favourite.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 58 lbs. The largest crop was 76 lbs., grown by G. Armstrong, of Fredericton.

Quebec.—Number of reports received, 21; average yield from 3 lbs., 52 lbs. The largest yield was 135 lbs., grown by J. L. Daigle, of St. Charles.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 45 lbs. The crops of P. W. Morrison, of Vars, and A. Cochrane, of Pembroke, each weighed 45 lbs.

Algoma No. 2.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 35 lbs. Grown by H. McQueen, of Orwell.

Nova Scotia.—Number of reports received, 5; average yield from 3 lbs., 57⅗ lbs. The largest crop was 100 lbs., grown by D. W. G. Stevens, of Merland.

New Brunswick.—Number of reports received, 3; average yield from 3 lbs., 22⅔ lbs. The largest crop was 36 lbs., grown by T. Watt, of Kintore.

Quebec.—Number of reports received, 1; yield from 3 lbs., 30 lbs. Grown by E. Legros, of St. Pamphile.

Ontario.—Number of reports received, 2; average yield from 3 lbs., 31 lbs. The largest crop was 32 lbs., grown by W. Doyle, of Bray's Crossing.

Wonder of the World.

Quebec.—Number of reports received, 19; average yield from 3 lbs., 52½ lbs. The largest crop was 139 lbs., grown by Rev. L. Douth, of St. Leonard d'Aston.

Ontario.—Number of reports received, 3; average yield from 3 lbs., 55⅓ lbs. The largest crop was 73 lbs., grown by W. Murray, of McLennan.

Daisy.

Prince Edward Island.—Number of reports received, 1; yield from 3 lbs., 120 lbs., grown by J. W. McDonald, of St. Peter's Bay.

Nova Scotia.—Number of reports received, 2; average yield from 3 lbs, 50 lbs. The largest crop was 55 lbs., grown by D. McLennan, of Middle River.

New Brunswick.—Number of reports received, 1; yield from 3 lbs., 52 lbs., grown by A. Smith, of Glen Anglin.

Quebec.—Number of reports received, 14; average yield from 3 lbs., 41 lbs. The largest crop was 110 lbs., grown by J. Nantel, of Chute aux Iroquois.

Ontario.—Number of reports received, 1; yield from 3 lbs., 32 lbs., grown by T. Luckham, of Birnam.

Thorburn.

Nova Scotia.—Number of reports received, 4; average yield from 3 lbs., 39¼ lbs. The largest crop was 60 lbs., grown by D. McRae, of Baddeck.

New Brunswick.—Number of reports received, 1; yield from 3 lbs., 120 lbs., grown by Wm. Charters, of Upper Maugerville.

Quebec.—Number of reports received, 8; average yield from 3 lbs., 38½ lbs. The largest crop was 65 lbs., grown by A. Fortin, of St. Jérôme, Lake St. John.

Ontario.—Number of reports received, 1; yield from 3 lbs., 95 lbs., grown by A. J. Kyle, of Eastman's Springs.

May Queen.

New Brunswick.—Number of reports received, 2; average yield from 3 lbs., 60 lbs. The largest crop was 90 lbs., grown by H. E. Northrup, of Kingston.

Quebec.—Number of reports received, 2; average yield from 3 lbs., 31 lbs. The largest crop was 32 lbs., grown by A. G. Moreau, of Ste. Marguerite.

Chicago Market.

Quebec.—Number of reports received, 5; average yield from 3 lbs., 38 lbs. The largest crop was 90 lbs., grown by J. Elliott, of St. Paulin.

Ontario.—Number of reports received, 1; yield from 3 lbs., 35 lbs., grown by J. S. Ryan, of Head Lake.

Manitoba.—Number of reports received, 1; yield from 3 lbs., 75 lbs. Grown by J. Plamondon, of St. Jean Baptiste.

Beauty of Hebron.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs., 95 lbs., grown by D. W. G. Stevens, of Merland.

Quebec.—Number of reports received, 3; average yield from 3 lbs., 50⅓ lbs. The largest crop was 75 lbs., grown by E. Dupont, of St. Sévère.

Early Sunrise.

Quebec.—Number of reports received, 7; average yield from 3 lbs., 88 lbs. The largest crop was 130 lbs., grown by Rev. E. Douth, of St. Leonard.

Rural Blush.

Nova Scotia.—Number of reports received, 1; yield from 3 lbs. 53 lbs., grown by J. Gillis, of Port Hood.

Ontario.—Number of reports received, 1; yield from 3 lbs. 85 lbs., grown by S. J. Ryan, of Head Lake.

EXPERIMENTS WITH OATS.

During the season of 1892, 52 varieties of oats have been tested at the Central Experimental Farm, 31 of which have been grown as field crops, the remainder in smaller plots. Twenty-four of these varieties were sown side by side all on the same day, on plots of one-twentieth of an acre each, with the view of ascertaining their

relative earliness and productiveness under similar conditions, the results are given in the appended table. The soil was dark sandy loam, which received a dressing of Royal Canadian fertilizer, 400 lbs. per acre, in the spring of 1892; the land was ploughed late in the autumn of 1891: disc harrowed twice in the spring of 1892, and once with smoothing harrow.

Test of Varieties of Oats, all sown same day.

Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush. Lbs.	Lbs.
Rosedale	April 26	Aug. 8	104	64 24	38½
American Banner	do 26	do 8	104	63 18	36
Rennie's Prize White	do 26	do 1	97	63 18	41¾
Cave	do 26	do 9	105	63 2	35¾
Abyssinia	do 26	do 8	104	61 26	39¼
Golden Beauty	do 26	do 8	104	60 08	35¾
Wide-awake	do 26	do 8	104	59 32	35¾
Holstein Prolific	do 26	do 14	110	59 18	36¼
American Beauty	do 26	do 8	104	54 24	36
Early Gothland	do 26	do 8	104	54 24	38¾
Improved Ligowo	do 26	do 9	105	52 32	37
Oderbruch	do 26	do 15	111	51 26	33¾
Siberian	do 26	do 15	111	51 6	34
White Dutch	do 26	do 1	97	50 00	38¾
Joanette	do 26	do 10	106	48 28	37¾
Hazlett's Seizure	do 26	July 31	96	48 8	40¾
Giant White Side	do 26	Aug. 14	110	46 23	31
Early Archangel	do 26	do 7	103	46 2	41½
Royal Doncaster Prize	do 26	do 14	110	46 1	36¼
Abundance	do 26	do 14	110	45 30	33¼
Giant Cluster	do 26	do 15	111	45 10	32
Black Tartarian, Prolific	do 26	do 10	106	44 24	33½
Prize Cluster	do 26	do 7	103	40 14	40
Challenge White, Canadian	do 26	do 6	102	34 11	41

Records of Larger Field Plots.

American Beauty.—On sandy loam; previous crop was corn; manured in spring of 1890. Land ploughed in spring of 1892; harrowed twice; 1⅓ acres; sown April 21st; 1¾ bushels per acre; ripe, August 5th; time to mature, 106 days; yield per acre, 47 bushels; weight per bushel, 37½ lbs.; oat long, yellowish; length of panicle, 7 to 9 inches; branching; length of straw, 39 to 42 inches; moderately coarse, standing fairly well on high land and very badly lodged on low land; almost destroyed by rust on low land; not so bad on high land.

Abyssinia.—Onl ight, sandy soil; previous crop was Banner oats manured in spring of 1892. Ploughed in spring of 1892 and harrowed with smoothing harrow twice; ½ acre; sown April 29th, 1½ bushels per acre; ripe, August 8th; time to mature, 101 days; yield per acre, 34 bushels and 16 lbs.; weight per bushel, 39¼ lbs.; Oat short to medium, plump and white; length of panicle, 7 to 9 inches; branching; length of straw, 36 to 40 inches; standing well; stem considerably rusted.

Abundance.—On sandy loam; previous crop was two-rowed barley; ploughed in autumn of 1891; disc harrowed twice, and with smoothing harrow once in spring of 1892; ¾ acre; sown April 30th; 2½ bushels per acre; ripe, August 7th and 8th; time to mature, 99 days; yield per acre, 34 bushels and 25 lbs.; weight per bushel, 33½ lbs.; Oat long, rather slender, yellowish white; length of panicle, 7 to 9 inches; branching; length of straw, 40 to 44 inches; medium coarse; badly lodged; stem considerably rusted.

Bonanza.—On sandy loam. Previous crop was corn; manured in spring of 1890; ploughed spring of 1892; harrowed twice; ½ acre; sown April 21st; 1½

bushels per acre; ripe, July 29th; time to mature, 99 days; yield per acre, 47 bushels and 21 lbs.; weight per bushel, 43½ lbs.; Oat short, white and plump; length of paniele, 9 to 12 inches; branching; length of straw, 48 to 50 inches; very slender; considerably lodged; stem considerably rusted.

Banner.—On light sandy soil; previous crop was oats; manured in autumn of 1891; ploughed autumn of 1891; in spring of 1892 disc harrowed twice, and with smoothing harrow once; 8 acres; sown April 30th; 2 bushels per acre; ripe, August 13th; time to mature, 105 days; yield per acre, 26 bushels and 13 lbs.; weight per bushel, 37¼ lbs.; oat long and white; length of panicle, 9 to 11 inches; branching; length of straw, 30 to 36 inches; standing well; very little rust. Water stood too long on a large part of plot and scalded it, which very much lessened the yield of this variety.

Black Brie.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891; was disc harrowed in spring of 1892 twice, and once with smoothing harrow; $\frac{1}{10}$ acre; sown April 30th; 2¼ bushels per acre; ripe, August 15th; time to mature, 107 days; yield per acre, 34 bushels and 28 lbs.; weight per bushel, 33 lbs.; oat medium to long, slender, tawny to black, length of panicle, 7 to 9 inches; branching; length of straw, 38 to 44 inches; slender straw; standing fairly well; stem considerably rusted.

Cream Egyptian.—On sandy loam; previous crop was pease; this was the first crop since breaking, has never had manure; ploughed in spring of 1892, harrowed with smoothing harrow three times; 1¾ acres; sown April 20th, 1¾ bushels per acre; ripe August 2nd; time to mature, 104 days; yield per acre, 36 bushels 18 lbs.; weight per bushel, 38½ lbs.; oat medium length, fairly plump, white; length of panicle, 8 to 10 inches, sided; length of straw, 44 to 48 inches; strong and fairly coarse; considerably lodged; stem very badly rusted.

Cave.—On sandy loam; previous crop was corn; manured in spring of 1890; ploughed in spring of 1892 and harrowed twice; 1 acre; sown April 21st; 1½ bushels per acre, ripe August 5th; time to mature, 106 days; yield per acre, 45 bushels 16 lbs.; weight per bushel, 40¼ lbs.; oat medium length, white and plump; length of paniele, 7 to 9 inches; loosely sided; length of straw 40 to 43 inches; considerably lodged on low land and standing fairly well on high land; not much rust on high land and almost ruined by it on low land.

Challenge White Canadian.—On light sandy soil; previous crop was Banner oats, manured in spring 1892; ploughed in spring 1892; harrowed with smoothing harrow twice; ¾ acre; sown April 29th; 1¾ bushels per acre; ripe August 1st; time to mature, 94 days; yield per acre, 39 bushels 31 lbs.; weight per bushel, 42 lbs.; oat short, plump and white; length of paniele, 7 to 9 inches; branching; length of straw 38 to 40 inches; straw very slender and weak; considerably broken down about one foot from ground; stem considerably rusted.

Californian Prolific Black.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892 and once with smoothing harrow; ½ acre: sown April 29th; 2 bushels per acre; ripe August 14th and 15th; time to mature, 107 and 198 days; yield per acre, 34 bushels 1 lb.; weight per bushel, 37½ lbs.; oat medium length. slender, tawny; length of panicles 7 to 10 inches; sided; length of straw, 38 to 42 inches; straw coarse, standing fairly well; stem badly rusted.

Coulommiers.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891, and dise harrowed twice, and once with smoothing harrow in spring of 1892; ⅓ acre; sown April 30th; 2¼ bushels per acre; ripe Aug. 16th; time to mature, 108 days; yield per acre, 35 bushels 33 lbs.; weight per bushel, 30¾ lbs.; oat short, plump and black; length of panicle, 7 to 9 inches branching; length of straw 33 to 36 inches, very slender; standing well; stem badly rusted. Was injured by water.

Early Archangel.—On light sandy soil; previous crop was Banner oats; manured in spring of 1892; ploughed in spring of 1892, and harrowed with smoothing harrow twice; ½ acre; sown April 29th; 1½ bushels per acre; ripe Aug. 4th; time to mature, 97 days; yield per acre, 32 bushels 1 lb.; weight per bushel, 42 lbs.; oat

medium length, plump, white; length of panicle 6 to 7 inches branching; length of straw 40 to 45 inches, rather slender; standing fairly well; stem considerably rusted.

Early Etampes.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891; it was disc harrowed in spring of 1892, twice, and with smoothing harrow once; $\frac{1}{3}$ acre; sown April 30th; $2\frac{1}{2}$ bushels per acre; ripe Aug. 8th; time to mature 100 days; yield per acre 14 bushels 13 lbs.; weight per bushel $36\frac{3}{4}$ lbs.; oat medium to long, not very plump, black; length of panicle 8 to 10 inches; branching: length of straw 38 to 40 inches; straw slender; standing fairly well; stem considerably rusted. Very much injured by water.

Early Gothland.—On sandy loam; previous crop was part corn and part barley; manured in autumn of 1891; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892, and with smoothing harrow once; $\frac{1}{10}$ acre; sown April 30th; $1\frac{1}{2}$ bushels per acre; ripe Aug. 8th; time to mature, 100 days; yield per acre 34 bushels 18 lbs.; weight per bushel, $31\frac{3}{4}$ lbs.; oat short to medium, white; length of panicle, 6 to 9 inches; length of straw, 36 to 38 inches; straw moderately slender; considerably lodged, stem badly rusted.

English Potato.—On sandy loam; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892; harrowed with smoothing harrow three times; 4 acres; sown May 13th; $1\frac{3}{4}$ bushels per acre; ripe Aug. 12th; time to mature, 91 days; yield per acre, 24 bushels 7 lbs.; weight per bushel, 32 lbs.; oat short and white; length of panicle, 7 to 10 inches, sided; length of straw, 36 to 44 inches, very badly lodged; stem considerably rusted.

Flying Scotchman.—On sandy loam; previous crop was corn; manured in spring of 1890; ploughed in spring of 1892, and harrowed twice; 1 acre; sown 21st April, $1\frac{1}{2}$ bushels per acre; ripe 31st July; time to mature, 101 days; yield per acre, 53 bushels, 29 lbs.; weight per bushel, 42 lbs.; oat short to medium, plump, white; length of panicle, 11 to 12 inches; branching; length of straw, 50 to 52 inches, straw very slender; considerably lodged; stem considerably rusted.

Giant Cluster.—On sandy loam; previous crop was Kinver Chevalier barley; manured in spring of 1890; ploughed in autumn of 1891, gang plowed in spring of 1892 and harrowed with smoothing harrow; 5 acres; sown 22nd April, $1\frac{3}{4}$ bushels per acre; ripe 8th August; time to mature, 108 days; yield per acre, 43 bushels 21 lbs; weight per bushel, $31\frac{1}{4}$ lbs.; oat long, rather slender, deep yellow; length of panicle, 9 to 12 inches; sided; length of straw, 45 to 50 inches, straw coarse; standing well; much injured by rust.

Giant Swedish.—On light sandy soil; previous crop was Banner oats; manured in spring of 1892; ploughed in spring of 1892 and harrowed with smoothing harrow twice; 1 acre; sown 29th April; $1\frac{1}{2}$ bushels per acre; ripe 15th August; time to mature, 108 days; yield per acre, 32 bushels 5 lbs.; weight per bushel, $31\frac{1}{2}$ lbs.; oat long, and yellow; length of panicle, 7 to 10 inches, sided; length of straw, 34 to 40 inches; straw medium as to coarseness; all standing well; stem slightly rusted.

Golden Beauty.—On sandy loam; previous crop part corn and part barley; manured in the autumn of 1891; ploughed in the autumn of 1891; it was disc harrowed twice in the spring of 1892 and with smoothing harrow once; $\frac{1}{2}$ acre; sown 30th April; $1\frac{3}{4}$ bushels per acre; ripe 5th August; time to mature, 97 days; yield per acre, 43 bushels 13 lbs.; weight per bushel, $33\frac{1}{2}$ lbs.; oat medium to long, pale yellow; length of panicle 7 to 9 inches; branching; length of straw 40 to 45 inches; straw not too coarse; all standing fairly well; stem very badly rusted.

Holstein Prolific.—On heavy sandy loam mixed with clay; previous crop experimental plots of grain; manured in spring of 1891; ploughed in autumn of 1891. It was disc harrowed once in spring of 1892 and twice with smoothing harrow; 4 acres; sown 22nd April; 2 bushels per acre; ripe 2nd August; time to mature, 102 days; yield per acre, 30 bushels 14 lbs.; weight per bushel, 33 lbs.; oat long, pale yellow; length of panicle, 7 to 9 inches; branching; length of straw, 40 to 48 inches; straw rather slender; considerably lodged and broken by wind and rain storms; stem considerably rusted.

Hazlett's Seizure.—On light sandy soil; previous crop was Banner oats; manured in spring of 1892; ploughed in spring of 1892 and harrowed with smoothing harrow twice; $\frac{2}{3}$ acre; sown 29th April; $1\frac{1}{2}$ bushels per acre; ripe 4th August; time to mature, 96 days; yield per acre, 29 bushels 30 lbs.; weight per bushel, $43\frac{3}{4}$ lbs.; oat short, plump and white; length of panicle, 9 to 11 inches; branching; length of straw, 38 to 43 inches; straw moderately coarse; standing fairly well; stem considerably rusted.

Houdan.—On clay loam; previous crop was flax; no manure; ploughed in spring of 1892, harrowed three times with smoothing harrow; $1\frac{1}{3}$ acres; sown 13th May; 2 bushels per acre; ripe 13th August; time to mature, 92 days; yield per acre, 38 bushels 8 lbs.; weight per bushel, 33 lbs.; oat medium length, tawny to black; length of panicle, 7 to 9 inches; branching; length of straw, 30 to 36 inches; straw rather too slender; standing well; stem considerably rusted.

Improved Ligowo.—On sandy loam; previous crop was six-rowed barley; manured in spring of 1890; ploughed in autumn of 1891, gang ploughed in spring of 1892 and harrowed with smoothing harrow; $1\frac{1}{3}$ acres; sown 22nd April; $1\frac{3}{4}$ bushels per acre; ripe 7th August; time to mature, 107 days; yield per acre, 34 bushels 26 lbs.; weight per bushel, 36 lbs.; oat medium to long, white; length of panicle, 7 to 10 inches; branching; length of straw 40 to 44 inches; straw medium; stem considerably rusted.

Joanette.—On sandy loam; previous crop was barley; manured in autumn of 1891; ploughed in autumn of 1891, disc harrowed twice and once with smoothing harrow in spring of 1892; $1\frac{1}{8}$ acres; sown 29th April; 2 bushels per acre; ripe 13th August; time to mature, 106 days; yield per acre, 45 bushels 20 lbs.; weight per bushel, 35 lbs.; oat medium to long, tawny to black; length of panicle, 7 to 9 inches; branching; length of straw, 30 to 36 inches; straw slender and weak; not badly lodged; stem considerably rusted.

Oderbruch.—On clay loam; previous crop was oats; manured in spring of 1892; plowed in spring of 1892, harrowed with smoothing harrow three times; $13\frac{1}{3}$ acres; $1\frac{3}{4}$ bushels per acre; sown May 13th; ripe August 16th; time to mature, 95 days; yield per acre, 45 bushels 20 lbs.; weight per bushel, $33\frac{1}{2}$ lbs.; oat medium length, white; length of panicle, 7 to 11 inches; sided; length of straw, 36 to 44 inches; standing fairly well; stem considerably rusted.

Prize Cluster.—On clay loam, part peat; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892, harrowed with smoothing harrow three times; $8\frac{1}{4}$ acres; sown May 10th; $1\frac{1}{2}$ bushels per acre; ripe August 13th; time to mature, 95 days; yield per acre, 22 bushels 28 lbs. (Note—apparently nearly one-half lay shelled on the ground after a heavy storm) weight per bushel, $35\frac{3}{4}$ lbs.; oat short, white; length of panicle, 7 to 10 inches; branching; length of straw, 36 to 40 inches; straw rather too weak; badly broken and lodged; stem very badly rusted.

Royal Doncaster Prize.—On clay loam; previous crop was experimental plots of grain; manured in autumn of 1891; it was disc harrowed once in spring of 1892, and harrowed twice with smoothing harrow; $2\frac{1}{3}$ acres; sown, 22nd April; $1\frac{1}{2}$ bushels per acre; ripe, 4th August; time to mature, 104 days; yield per acre, 22 bushels 1 lb.; weight per bushel, $33\frac{1}{4}$ lbs.; oat short, white; length of panicle, 8 to 9 inches; branching; length of straw, 40 to 44 inches; straw rather slender; standing fairly well, a few spots lodged; stem very badly rusted.

Rennie's Prize White.—On light sandy soil; previous crop was Banner oats; manured in spring of 1892; ploughed in spring of 1892, and harrowed three times with smoothing harrow; 1 acre; sown 9th May; $1\frac{1}{2}$ bushels per acre; ripe, 8th August; time to mature, 91 days; yield per acre, 45 bushels 1 lb.; weight per bushel, $38\frac{1}{2}$ lbs; oat short, white much like Prize Cluster; length of panicle, 7 to 9 inches; branching; length of straw, 36 to 42 inches; straw weak, badly broken down and lodged; stem, badly rusted.

Rosedale.—On sandy loam; previous crop was pease; manured in spring of 1892; ploughed in spring of 1892, and harrowed with smoothing harrow twice; $3\frac{1}{4}$ acres; sown 27th April; $1\frac{1}{2}$ bushels per acre, ripe 10th August; time to mature, 105 days; yield per acre, 36 bushels 14 lbs.; weight per bushel, $37\frac{1}{4}$ lbs.; oat short to

medium, white; length of panicle, 8 to 10 in.; sided to slightly branching; length of straw, 38 to 44 in.; straw coarser than Prize Cluster; badly lodged; stem considerably rusted.

Scottish Chief.—On sandy loam; previous crop was part corn and part barley; manured in autumn of 1891; ploughed in autumn of 1891, in spring of 1892 it was disc harrowed twice and with smoothing harrow once; $\frac{1}{10}$ acre; sown 30th April; $1\frac{1}{2}$ bushels per acre, ripe 4th August; time to mature, 96 days; yield per acre, 47 bushels 8 lbs.; weight per bushel, 41·lbs.; oat short to medium, white; length of panicle, 9 to 11 in.; branching; length of straw, 40 to 45 in.; straw rather coarse but rather weak; very badly broken about one foot from ground; stem badly rusted.

Black Tartarian.—On sandy loam; previous crop was part corn and part barley; barley land only manured in autumn of 1891; ploughed in autumn of 1891, in spring of 1892 it was disc harrowed twice and with smoothing harrow once; $1\frac{1}{8}$ acre; sown 30th April; 2 bushels per acre, ripe 13th August; time to mature, 105 days; yield per acre, 36 bushels; weight per bushel, 33 lbs.; oat long, tawny to black; length of panicle, 7 to 11 in.; sided; length of straw, 38 to 40 in.; standing fairly well; stem badly rusted.

EXPERIMENTS WITH BARLEY.

During the past season fifty-eight varieties of barley have been grown on the Central Experimental Farm of which thirty-six were two-rowed sorts and twenty-two six-rowed. Fourteen of these varieties have been grown in field plots nine of two-rowed and five of six-rowed, particulars of the results will be found appended; the remaining varieties have all been grown in smaller plots. Of the two-rowed sorts thirteen of the most promising were sown side by side on the same day in plots of one-twentieth of an acre for the purpose of determining their relative earliness and productiveness, ten varieties of six-rowed barley were subject to a similar test. These plots were alongside of the one-twentieth acre plots of oats. For particulars as to treatment of the land see experiments with oats. Owing to the unfavourable season the barley crops are below the average of previous years both in quantity and quality.

Two-rowed Barley.

Test of Varieties, all sown same day.

Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush. Lbs.	Lbs.
Swedish	April 26	Aug. 3	99	45 00	52¼
Duck-bill	do 26	do 4	100	40 20	51¼
Phœnix von Thalen	do 26	do 1	97	40 00	51½
Danish Chevalier	do 26	do 8	104	35 00	51¼
Kinver Chevalier	do 26	do 7	103	34 08	51¼
French Chevalier	do 26	do 8	104	33 16	50¼
Italian	do 26	do 5	101	32 24	48¾
New Golden Grains	do 26	do 7	103	32 08	49¾
Canadian Thorpe	do 26	do 5	101	31 12	50¾
Odessa Two-rowed	do 26	July 30	95	30 00	50¾
Saale	do 26	Aug. 7	103	28 16	49¼
Prize Prolific	do 26	do 7	103	27 24	49½
Goldthorpe	do 26	do 14	110	27 04	50

Larger Field Plots of Two-rowed Barley.

Canadian Thorpe.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1889; ploughed in autumn of 1891; disc harrowed twice in spring of 1892, and once with smoothing harrow; 1¾ acres; sown, April 27th; 1¾ bushels per acre; ripe, August 1st; time to mature, 96 days; yield per acre, 27 bushels and 3 lbs.; weight per bushel, 48¾ lbs.; length of head, 2½ to 3½ inches, length of straw, 38 to 42 inches. All standing well; no rust.

Duck-bill.—On sandy loam; previous crop was turnips; manured in spring of 1891; ploughed in autumn of 1891, and was disc harrowed twice in spring of 1892, and once with smoothing harrow; 1 acre; sown April 22nd; 1½ bushels per acre; ripe, July 31st; time to mature, 100 days; yield per acre cannot be estimated on account of large quantity of barley in straw being taken for exhibition purposes; weight per bushel, 47½ lbs.; length of head, 3 inches; length of straw, 47 to 49 inches; strong straw; standing very well, only a small spot lodged; stem slightly rusted.

Danish Chevalier—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1889; ploughed in autumn of 1891; disc harrowed twice and with smoothing harrow once in spring of 1892; 1⅙ acres; sown, April 27th; 1¾ bushels per acre; ripe, August 3rd and 4th; time to mature, 98 to 99 days; yield per acre, 24 bushels and 47 lbs.; weight per bushel, 48¼ lbs.; length of head, 4 to 4½ inches; length of straw, 35 to 38 inches; stem very slightly rusted.

Goldthorpe.—On clay loam; previous crop was wheat; manured in spring of 1892; ploughed in spring of 1892, and harrowed with smoothing harrow three times; 2⅓ acres; sown May 9th; 1½ bushels per acre; ripe, August 15th; time to mature, 98 days; yield per acre, 24 bushels and 26 lbs.; weight per bushel, 48¾ lbs.; length of head, 3 to 3½ inches; length of straw, 38 to 40 inches; all standing well; stem considerably rusted.

Kinver Chevalier.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1889; ploughed in autumn of 1891; disc harrowed twice and with smoothing harrow once in spring of 1892; 2¾ acres; sown April 27th; 1¾ bushels per acre; ripe, August 3rd; time to mature, 98 days; yield per acre, 30 bushels and 11 lbs.; weight per bushel, 50 lbs; length of head, 4 to 4½ inches; length of straw, 35 to 38 inches; straw rather slender and weak, but not badly lodged; stem very slightly rusted.

Large Two-rowed Naked.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1891; ploughed in autumn of 1891; disc harrowed twice and with smoothing harrow once in spring of 1892; ⅓ acre; sown April 27th; 2½ bushels per acre; ripe July 25th; time to mature 89 days; yield per acre, 26 bushels, 20 lbs.; weight per bushel, 60¾ lbs.; length of head, 2½ to 3 inches; length of straw, 28 to 34 inches; straw very weak; badly lodged; no rust.

Odessa two-rowed.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1891; ploughed in autumn of 1891, disc harrowed twice and once with smoothing harrow in spring of 1892; ¼ acre; sown April 27th; 1½ bushels per acre; ripe July 27th; time to mature, 91 days; yield per acre, 31 bushels, 5 lbs.; weight per bushel, 48½ lbs.; length of head, 3¼ to 3½ inches; length of straw, 38 to 43 inches; straw very weak and badly lodged; stem slightly rusted.

Prize Prolific.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1889; ploughed in autumn of 1891; disc harrowed twice and once with smoothing harrow in spring of 1892; 2 acres; sown April 27th; 1¾ bushels per acre; ripe August 2nd; time to mature, 97 days; yield per acre, 27 bushels 35 lbs.; weight per bushel, 49½ lbs.; length of head, 4 to 4½ inches; length of straw, 35 to 38 inches; considerably lodged; stem very slightly rusted.

Saale.—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1891; ploughed in autumn of 1891; disc harrowed twice and once with smoothing harrow in spring of 1892; 1 acre; sown April 27th; 1¾ bushels per acre; ripe August 2nd; time to mature, 97 days; yield per acre, 31 bushels, 32 lbs,; weight per bushel, 47½ lbs.; length of head, 4 to 4½ inches; length of straw, 35 to 38 inches; considerably lodged; stem very slightly rusted.

SIX-ROWED BARLEY.

TEST of Varieties, all sown same day.

Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush. Lbs.	Lbs.
Common	April 26....	July 28....	93	36 32	49½
Mensury	do 26....	do 31....	96	36 32	48¾
Odessa Six-rowed	do 26...	do 30....	95	29 8	50
Petschora	do 26....	do 28....	93	29 8	47
Norway House, from	do 26....	do 28....	93	28 16	47¼
Rennie's Improved	do 26 ...	do 31....	96	27 24	48½
Oderbruch	do 26....	do 28....	93	27 4	49¼
Baxter's Six-rowed	do 26....	do 31....	96	24 8	46¾
Guaymalaye (Hulless)	do 26 ...	Aug. 1....	97	20 00	57½
Sialkot	do 26....	July 26....	91	19 8	44¾

Baxter's Six-rowed.—On clay loam and peat; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892, and harrowed three times with smoothing harrow, 1¼ acre; sown May 9th; 1½ bushels per acre; ripe Aug. 1st; time to mature, 84 days; yield per acre, 30 bushels 33 lbs.; weight per bushel, 50 lbs.; length of head, 2½ to 2¾ inches; length of straw, 40 to 42 inches, standing very well, only one spot lodged; stem very slightly rusted.

Guaymalaye (Hulless).—On sandy loam; previous crop was Prize Cluster oats; manured in spring of 1891; ploughed in autumn of 1891, in spring of 1892 it was disc harrowed twice and once with smoothing harrow; ⅛ acre; sown April 27th; 1¾ bushels per acre; ripe July 26th; time to mature, 90 days; yield per acre, 26 bushels 9 lbs.; weight per bushel, 59¾ lbs.; length of head, 2½ to 3 inches; length of straw, 40 to 44 inches; very badly lodged; stem considerably rusted.

Odessa Six-rowed.—On light sandy soil; a crop of peas was ploughed in when in flower for manure in summer of 1891; ploughed again in spring of 1892, and harrowed with smoothing harrow twice; ½ acre; sown May 3rd; 1¾ bushels per acre; ripe July 27th; time to mature, 85 days; yield per acre, 44 bushels 3 lbs.; weight per bushel, 47½ lbs.; length of head, 2½ to 3 inches; length of straw, 33 to 36 inches, standing well; no rust.

Oderbruch.—On light sandy soil; a crop of pease was ploughed in when in flower for manure in summer of 1891; ploughed again in spring of 1892, and harrowed with smoothing harrow twice; ⅔ acres; sown May 3rd; 1¾ bushels per acre; ripe, July 25th; time to mature, 85 days; yield per acre, 47 bushels 25 lbs.; weight per bushel, 49½ lbs.; length of head, 2½ to 2¾ inches; length of straw, 30 to 39 inches standing fairly well; no rust.

Rennie's Improved Six-rowed.—On light sandy soil; a crop of pease was ploughed in when in flower for manure in summer of 1891; ploughed in spring of 1892, and harrowed with smoothing harrow twice; 1 acre; sown May 3rd, 1¾ bushels per acre; ripe, July 26th and 27th; time to mature, 84 to 85 days; yield per acre, 38 bushels 24 lbs.; weight per bushel, 48 lbs.; length of head, 2½ to 2¾ inches; length of straw, 40 to 44 inches standing fairly well: no rust.

EXPERIMENTS WITH WHEAT.

During the season of 1892, 46 varieties of spring wheat have been tested, 8 of which have been grown in field plots, the remainder in smaller plots. Of these latter, 19 sorts have been tested as to their relative earliness and productiveness, by sowing them all on the same day side by side, on a fairly uniform piece of land, a dark sandy loam which received a dressing of Royal Canadian fertilizer, 400 lbs. per acre in the spring of 1892. The land was ploughed late in the autumn of 1891,

disc harrowed twice and once with smoothing harrow in the spring of 1892. The results are given in the appended table.

Test of Varieties of Spring Wheat, all sown same day.

Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush. Lbs.	Lbs.
Pringle's Champlain	April 23	Aug. 7	106	29 00	61
Hueston's	do 23	do 9	108	28 40	58¼
Wellman's Fife	do 23	do 14	113	28 32	59
White Russian	do 23	do 14	113	27 19	58
Rio Grande	do 23	do 14	113	27 00	60¾
Judket	do 23	do 14	113	24 40	58½
Great Western	do 23	do 14	113	24 00	60¾
White Fife	do 23	do 14	113	23 36	58¾
White Chaff, Campbell's	do 23	do 6	105	23 20	56¾
Red Fern	do 23	do 9	108	23 20	60½
White Connell	do 23	do 9	108	21 50	57½
Ladoga	do 23	do 3	102	21 40	58¼
Black Sea	do 23	do 1	100	21 40	57¾
Triumph, Campbell's	do 23	do 6	105	21 20	60
Johnston's Defiance	do 23	do 9	108	20 00	57½
Lahoul	do 23	July 31	99	19 5	54
Red Fife	do 23	Aug. 14	113	19 00	58
Anglo Canadian	do 23	do 9	108	17 20	54
Hard Calcutta	do 23	July 31	99	15 00	61¼

Campbell's White Chaff.—On sandy loam; previous crop was Prize Prolific barley; has had no manure since farm was purchased; ploughed in autumn of 1891, disc harrowed once and twice with smoothing harrow in spring of 1892; 3⅔ acres; sown 29th April; 1½ bushels per acre; ripe, 9th August; time to mature, 102 days; yield per acre, 15 bushels; weight per bushel, 54¼ lbs; length of head 3 to 3½ inches; beardless; length of straw, 45 to 48 inches; stem very badly rusted; considerably broken down about 1 foot from ground.

Colorado.—On sandy loam and peaty soil; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and with smoothing harrow once; ¾ acre; sown 2nd May; 1½ bushels per acre; ripe, 9th August; time to mature, 99 days; yield per acre, 13 bushels, 37 lbs. (note—yield lessened considerably by loss from shelling); weight per bushel, 54¾ lbs; length of head, 2½ to 3½ inches; bearded; length of straw, 36 to 40 inches; straw slender; standing fairly well; very little rust.

Lahoul.—On sandy soil; previous crop was turnips; manured in spring of 1888, and had a coat of ashes in spring of 1891; ploughed in autumn of 1891; disc harrowed once and with smoothing harrow twice in spring of 1892; ¼ acre; sown, 21st April; 1½ bushels per acre; ripe, 3rd August; time to mature, 104 days; yield per acre, 10 bushels, 38 lbs; weight per bushel, 54 lbs; length of head, 3 inches; bearded; length of straw, 30 to 36 inches; straw rather slender; all standing well; stem considerably rusted.

Rio Grande.—On sandy loam and peaty soil; previous crop was Prize Prolific barley; has had no manure; ploughed in autumn of 1891; it was disc harrowed once in spring of 1892 and twice with smoothing harrow; 4 acres; sown, 29th April; 1½ bushels per acre; ripe, 13th August; time to mature, 106 days; yield per acre, 18 bushels, 27 lbs; weight per bushel, 58½ lbs; length of head, 3½ to 4 inches; bearded; length of straw, 45 to 50 inches; standing well; straw, very bright and strong.

Red Fife.—On sandy loam; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892 and once with smoothing harrow; ¾ acre; sown 30th April; 1½ bushels per acre; ripe 13th August; time to mature, 105 days; yield per acre, 23 bushels, 31

lbs.; weight per bushel, 58¼ lbs.; length of head, 3½ to 3¾ in.; beardless; length of straw, 38 to 44 in.; stem slightly rusted.

White Fife.—On sandy loam; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892 and once with smoothing harrow; ¾ acre; sown 30th April; 1½ bushels per acre; ripe 13th August; time to mature, 105 days; yield per acre, 22 bushels, 38 lbs.; weight per bushel, 59¼ lbs.; length of head, 3½ to 4 in.; beardless; length of straw, 38 to 44 in.; stem slightly rusted.

White Connell.—On sandy loam; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891; it was disc harrowed twice in spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 1½ bushels per acre; ripe 15th August; time to mature 105 days: yield per acre, 15 bushels 51 lbs; weight per bushel, 58 lbs.; length of head 3½ to 4 inches; beardless; length of straw, 40 to 46 inches; straw very stiff and standing well; stem slightly rusted.

White Russian.—On sandy loam; previous crop was two-rowed barley; manured in spring of 1890; ploughed in autumn of 1891, it was disc harrowed twice in the spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 1½ bushels per acre; ripe 13th August; time to mature, 103 days; yield per acre, 14 bushels 3 lbs.; weight per bushel, 56½ lbs.; length of head, 3 to 3¼ inches; beardless; length of straw, 30 to 35 inches; standing well; stem slightly rusted.

EXPERIMENTS WITH PEASE.

Eleven varieties of pease were sown in field plots with the following results:—

Black-eyed Marrowfat.—On sandy soil; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892 and harrowed twice with smoothing harrow; 1 acre; sown 23rd April; 3¾ bushels per acre; ripe August 10th; time to mature, 109 days; yield per acre, 19 bushels 48 lbs.; weight per bushel, 60½ lbs.; vines made a very strong growth.

Crown.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 2½ bushels per acre; ripe 7th August; time to mature, 97 days; yield per acre, 24 bushels 40 lbs.; weight per bushel 63¼ lbs.; length of vines, 38 to 40 inches; vines made very strong growth.

Centennial.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 2¾ bushels per acre; ripe August 12th; time to mature, 102 days; yield per acre, 21 bushels 23 lbs.; weight per bushel, 62½ lbs.; length of vine, 45 to 50 inches; vines made very strong growth.

Daniel O'Rourke.—On sandy loam; previous crop was turnips; had a coat of ashes in spring of 1892; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and twice with smoothing harrow; ⅙ acre; sown 10th May; 2½ bushels per acre; time of ripening not noted; yield per acre, 20 bushels 12 lbs.; weight per bushel, 62 lbs.

Golden Vine.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and once with smoothing harrow; ¾ acre; sown 2nd May; 2½ bushels per acre; ripe 11th August; time to mature, 101 days; yield per acre, 22 bushels, 15 lbs.; weight per bushel, 65½ lbs.; length of vine, 40 to 46 inches; vines made very strong growth.

Large White Marrowfat.—On sandy soil; previous crop was oats; manured in spring of 1892; ploughed in spring of 1892 and harrowed twice with smoothing harrow; 1¼ acres; sown 23rd April; 3¾ bushels per acre; ripe 10th August; time to mature, 109 days; yield per acre, 16 bushels 25 lbs.; weight per bushel 61 lbs.; vines made very strong growth.

Mummy.—On sandy loam; previous crop was spring rye; manured in spring of 1888; ploughed in spring of 1892 and harrowed with smoothing harrow twice; 3 acres; sown 28th April; 3 bushels per acre; ripe 7th and 8th August; time to

mature, 101 to 102 days; yield per acre, 25 bushels, 8 lbs.; weight per bushel, 61¾ lbs.; length of vine 45 to 50 inches; vines made very strong growth.

Multiplier.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; disc harrowed twice in spring of 1892 and once with smoothing harrow; 1 acre; sown 2nd May; 2½ bushels per acre; ripe 11th August; time to mature 101 days; yield per acre, 19 bushels 47 lbs.; weight per bushel, 63½ lbs.; length of vine, 40 to 46 inches; vines made very strong growth.

Prince Albert.—On sandy soil; previous crop was oats; manured in spring of 1892, and ploughed and harrowed twice with smoothing harrow; 1 acre; sown 23rd April; 2½ bushels per acre; ripe, 9th August; time to mature, 108 days; yield per acre, 15 bushels and 43 lbs.; weight per bushel, 61 lbs.

Pride.—On sandy loam and peaty soil; previous crop was corn; manured in spring of 1890; ploughed in autumn of 1891; dise harrowed twice in spring of 1892, and once with smoothing harrow; 1⅓ acres; sown, 2nd May; 3¼ bushels per acre; ripe, 8th August; time to mature, 98 days; yield per acre, 16 bushels and 50 pounds; weight per bushel, 58 lbs; length of vine, 32 to 37 inches; vines made very strong growth.

EXPERIMENTS WITH TURNIPS.

Seventeen varieties of turnips were tested in plots, and the yield per acre in each case has been calculated from the weight of roots gathered from three rows, 2½ feet apart and 66 feet long. The first set of these plots was sown 13th May, the second 10th June, and harvested 17th October.

This crop suffered again from a peculiar form of rot attacking the root which has prevailed in the Ottawa district during the past two years. The injury from this disease in 1892 has been less than in 1891. No satisfactory explanation has yet been given as to the cause of this trouble, nor has any remedy been discovered to prevent it. The first series of plots was so much injured as to be practically worthless for the purpose of comparison. The second set of plots gave a partial crop, the particulars of which are given in the appended table:—

SECOND SERIES of Plots, sown 10th June.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Novelty Swede No. 1	14	1,920	498	40
Novelty Swede No. 2	13	1,984	466	24
Prize Purple Top (Rennie)	13	1,456	457	36
Hartley's Bronze	13	48	434	8
Mammoth Purple Top	12	992	416	32
Marquis of Lorne	12	288	404	48
Bronze Top Extra	12	288	404	48
Purple Top (Steele)	10	1,824	363	44
Jumbo or Monarch Swede	10	1,472	357	52
Carter's Elephant Purple Top	10	1,296	354	56
Prize Purple Top (Pearce)	9	1,008	316	48
Sutton's Champion	9	128	302	8
Greystone	7	1,840	264	0
Skirvings Improved Purple Top	6	1,392	223	12
Bangholm Purple Top Swede	6	1,024	217	4
Elephant or Giant King	5	560	176	0

One field plot of Skirvings Swede of about 1¾ acres gave a yield of 16 tons 1,448 lbs. per acre, equal to 557 bush. 28 lbs. These did not suffer so severely from rot as those in the smaller plots.

EXPERIMENTS WITH MANGELS.

Thirteen varieties of mangels have been grown in plots, side by side and the crop per acre calculated from the yield obtained from three rows $2\frac{1}{2}$ feet apart and 66 feet long. Two sets of these plots were sown, the first, 10th May, the second, 21st May. Those earlier sown were harvested 14th October, those later 17th October, with results given below. The soil was sandy loam, has had no manure, but received a coating of unleached ashes in the autumn of 1891, about 150 bushels per acre. It was ploughed in the autumn of 1891, disc harrowed twice in the spring of 1892, and twice with the smoothing harrow.

First Series of Plots, sown 10th May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Yellow Globe	26	1,152	885	52
Giant Yellow Intermediate	24	752	812	32
Berkshire Prize	24	224	803	44
Canadian Giant	23	640	777	20
Mammoth Long Red (Bruce)	23	464	774	24
Mammoth Long Red (Steele)	21	768	712	48
Selected Mammoth Long Red	20	1,008	683	28
Mammoth Long Red (Simmers)	20	480	674	40
Warden Globe	20	480	674	40
Red Fleshed Tankard	19	896	648	16
Red Globe Oberndorff	19	368	639	28
Red Globe	18	1,488	624	48
Golden Fleshed Tankard	18	960	616	00

Second Series of Plots, sown 21st May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Golden Fleshed Tankard	17	1,904	598	24
Mammoth Long Red (Bruce)	17	1,376	589	36
Giant Yellow Intermediate	17	848	580	48
Selected Mammoth Long Red	14	1,744	495	34
Red Globe	14	1,568	492	48
Red Fleshed Tankard	14	1,568	492	48
Warden Globe	14	1,040	484	00
Yellow Globe	14	864	481	4
Mammoth Long Red (Steele)	14	864	481	4
Canadian Giant	12	1,696	428	16
Berkshire Prize	12	1,344	422	24
Red Globe Oberndorff	11	1,408	390	8

EXPERIMENTS WITH CARROTS.

Fifteen varieties of carrots were tested side by side in two sets of plots, one sown 10th May, the other 21st May. The yield per acre has been calculated from the weight harvested from three rows, 18 inches apart and 66 feet long. The earlier sown plots were harvested on 14th October, the second series 21st October. Soil sandy loam, no manure, but had a coating of unleached ashes, about 150 bushels to the acre in the autumn of 1891. Land ploughed in the autumn of 1891, disc harrowed twice in the spring of 1892 and harrowed twice with the smoothing harrow.

First Series of Plots, sown 10th May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Early Gem	27	1,147	919	7
Danver's Orange	25	1,040	850	40
Oxheart or Guerande	23	1,227	787	7
Chantenay	22	888	748	00
New Mammoth White Intermediate	21	827	713	47
Improved Short White	20	1,067	684	27
Giant White Belgian	19	1,307	655	7
Large White Vosges	17	1,200	586	40
Orange Giant	17	1,053	584	13
Mammoth Intermediate Smooth White	16	707	545	7
Iverson's Champion	16	560	542	40
Selected Altringham	15	1,093	518	13
Improved Half Long White	15	507	508	27
Giant Short White Vosges	14	1,627	493	47
Large White Belgian	14	1,333	488	53

Second Series of Plots, sown 21st May.

Variety.	Yield per acre.		Yield per acre.	
	Tons.	Lbs.	Bush.	Lbs.
Danver's Orange	26	1,680	894	40
Mammoth Intermediate Smooth White	26	800	880	00
Improved Short White	23	933	782	13
New Mammoth White Intermediate	22	1,173	752	53
Chantenay	21	1,120	718	40
Improved Half Long White	21	1,120	718	40
Early Gem	20	1,946	699	6
Iverson's Champion	19	1,600	660	00
Oxheart or Guerande	19	1,013	650	13
Orange Giant	18	960	616	00
Large White Vosges	18	960	616	00
Giant White Belgian	18	960	616	00
Giant Short White Vosges	15	800	513	20
Large White Belgian	12	1,520	425	20
Selected Altringham	11	800	381	20

EXPERIMENTS WITH SUGAR BEETS.

Seven varieties of sugar beets were sown in plots, one set on 10th of May, the second on the 21st. The rows were 18 inches apart and the yield per acre was calculated from the product of 3 rows each 33 feet long. In the arrangement of tests of roots these plots were located alongside the tests of carrots and the character of the soil and its treatment will be found under "Experiments with Carrots." The plots first sown were harvested on October 14th, the second set October 17th.

FIRST SERIES of plots sown 10th May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Klein Wanzleben (1892)	15	1,680	528	00
Kruger	15	800	513	20
Vilmorin's No. 2	15	507	508	27
Klein Wanzleben (1891)	15	213	503	33
Brabant	14	1,627	493	47
Vilmorin's Improved	13	400	440	00
Vilmorin's No. 1	11	880	381	20

SECOND SERIES sown 21st May.

Variety.	Yield per Acre.		Yield per Acre.	
	Tons.	Lbs.	Bush.	Lbs.
Vilmorin's No. 1	23	1,813	796	53
Kruger	18	1,840	630	40
Vilmorin's No. 2	17	27	567	7
Brabant	13	1,867	464	27
Klein Wanzleben (1891)	12	640	410	40
Klein Wanzleben (1892)	11	1,467	391	7
Vilmorin's Improved	11	587	376	27

EXPERIMENTS WITH POTATOES.

Forty-eight varieties of potatoes have been tested, side by side, in rows 2½ feet apart, all planted on the 16th and 17th of May with pieces containing three eyes and placed one foot apart in the rows. They were harvested on the 4th and 5th of October. The soil was clay loam, previous crop wheat, stubble ploughed under lightly early in the fall to start shed grain and weeds, and cross ploughed later in the season, disc harrowed twice in the spring and once with smoothing harrow. Five crops had been taken from this land since operations began on the Experimental Farm and no manure or other fertilizer applied until the spring of 1892, when it received a dressing of Royal Canadian fertilizer in the proportion of 800 pounds to the acre. The plots varied in size, but in estimating the yield per acre it has been calculated in most cases from the product of two rows 66 feet long.

Variety.	Size of Plot.	Total Yield per Acre.		Yield per Acre of Marketable Potatoes.		Yield per Acre of Unmarketable Potatoes.		Weight of diseased potatoes per plot.
	Feet.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Lbs.
Everett	66 x 2½	407	00	363	00	44	00	5½
T. K. Fullerton, Calgary, N. W. T.	172 x 2½	389	24	330	00	59	24	0
Empire State	172 x 2½	380	36	294	48	85	48	0
Dakota Red	172 x 2½	369	36	327	48	41	48	0
Rural Blush	66 x 2½	367	24	319	00	48	24	0
Mr. Lemieux, Oak Lake, Man.	66 x 2½	365	12	330	00	35	12	0
Thorburn	172 x 2½	358	36	264	00	94	36	0
Early Sunrise	172 x 2½	343	12	259	36	83	36	0
Gleason's Late	172 x 2½	341	00	277	12	63	48	0
White Elephant	66 x 2½	338	48	303	36	35	12	½
State of Maine	172 x 2½	336	36	266	12	70	24	0
Nelson River, from	172 x 2½	336	36	242	00	94	36	0
Delaware	172 x 2½	327	48	270	36	57	12	0
Crown Jewel	172 x 2½	327	48	228	48	99	00	0
Clarke's No. 1	172 x 2½	321	12	224	24	96	48	0
Sharpe's Seedling	172 x 2½	316	48	228	48	88	00	0
Holborn Abundance	172 x 2½	316	48	231	00	85	48	0
Early Thorburn	172 x 2½	305	48	222	12	83	36	0
Daisy	172 x 2½	301	24	228	48	72	36	0
Summit	172 x 2½	299	12	231	00	68	12	0
Rosy Morn	172 x 2½	297	00	209	00	88	00	0
Algoma No. 3	172 x 2½	290	24	231	00	59	24	½
Vanguard	172 x 2½	288	12	198	00	90	12	0
Late Rose	172 x 2½	288	00	228	48	59	24	3
Wonder of the World	172 x 2½	283	48	224	24	59	24	0
Chas. Downing	172 x 2½	283	48	171	36	112	12	0
Burpee's Seedling	172 x 2½	283	48	165	00	118	48	0
Richter's Schneerose	172 x 2½	277	12	176	00	101	12	0
Burpee's Extra Early	172 x 2½	275	00	162	48	112	12	0
Careless Match	172 x 2½	270	36	215	36	55	00	6½
R. Debreau, Alberni, B. C.	172 x 2½	264	00	180	24	83	36	0
Halton Seedling	172 x 2½	261	48	189	12	72	36	0
Late Goodrich	172 x 2½	259	36	187	00	72	36	0
Early Eating	172 x 2½	259	36	158	24	101	12	0
Flower of Eden	172 x 2½	255	12	184	48	70	24	0
Beauty of Hebron	172 x 2½	255	12	176	00	79	12	0
Early Rose	172 x 2½	246	24	180	24	66	00	0
Vermont	172 x 2½	246	24	145	12	101	12	0
Green Mountain	172 x 2½	242	00	171	36	70	24	0
May Queen Early	172 x 2½	239	48	158	24	81	24	0
Early Puritan	172 x 2½	237	36	182	36	55	00	0
Rural No. 2	172 x 2½	231	00	171	36	59	24	0
Alexander Prolific	172 x 2½	220	00	147	24	72	36	0
London	172 x 2½	217	48	134	12	83	36	0
Lady's Finger	66 x 2½	180	24	...	...	...	...	0
Beauty of Beauties	172 x 2½	176	00	132	00	44	00	½
Eye Carpenter	172 x 2½	169	24	110	00	59	24	0
Stonewall	172 x 2½	77	00	39	36	37	24	0

In addition to those here named there were five or six of the leading sorts which have made a good record in former years, including Lee's Favourite, Algoma No. 1, Early Ohio, Chicago Market and Early Albino, which were planted on rather low ground, where the heavy rains which prevailed during the time of grain harvest so saturated the soil as to greatly injure the crop. For this reason the returns of these varieties are not given.

TESTING THE VITALITY OF GRAIN AND OTHER SEEDS.

The testing of the germinating power of seed grain and other seeds for farmers in the several provinces of the Dominion has been continued, and 1,370 samples have been tested. These samples are all tested in duplicate in order to reach greater accuracy and make the returns in every way reliable. This branch of the Experimental Farm work has rendered good service to many farmers by giving them such information as to the vitality of the grain they were holding for seed, as enabled them to choose those samples having a high germinating power, thus preparing the way for good crops. Samples can be sent to the Central Experimental Farm free through the mail; the quantity in each case should be about one ounce, and the returns giving the results of the test can usually be sent within ten days or a fortnight from the time the samples are received.

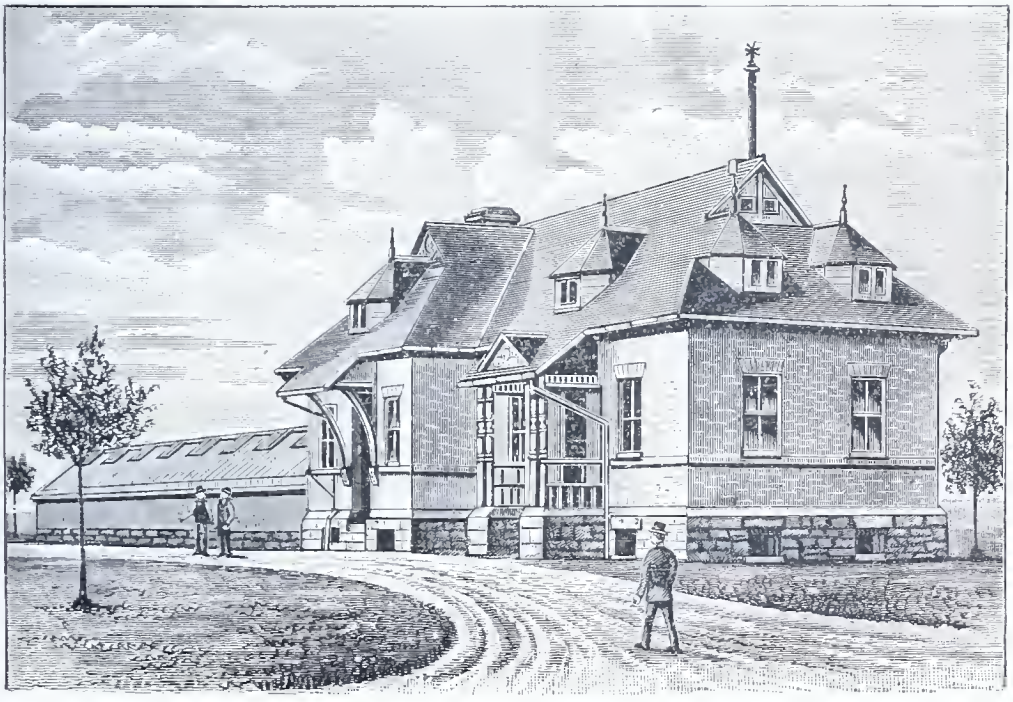


FIG. 2.—Building for seed testing and seed grain distribution.

The building which has been constructed for this purpose is shown in fig. 2, the glass structures in the rear are used for seed testing, while the front part affords accommodation for the distribution of samples of promising varieties of seed grain to farmers for test in all parts of the Dominion.

Results of Grain Tests, 1891–92.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Average Vitality.
Wheat	442	100	0	85·7
Barley	284	100	19	85·0
Oats	431	100	25	93·3
Pease	67	100	8	90·4
Beans	42	100	60	84·8
Rye	11	93	46	78·0
Corn	17	100	0	73·3
Clover	4	88	63	76·0
Tares	4	97	76	85·5
Grass	6	44	0	18·6
Carrots	5	65	17	43·2
Turnips	3	75	18	55·6
Sugar beets	5	82	62	72·8
Cauliflower	3	60	19	42·3
Celery	3	0	0	0·0
Cabbage	9	95	26	57·3
Onion	4	60	0	39·2
Radish	4	85	35	59·5
Tomato	5	93	36	64·2
Pumpkin	2	62	60	61·0
Flower seeds	8	88	6	35·7
Rhubarb	1	.....	.....	16·0
Mangel	1	.....	.....	82·0
Cress	1	.....	.....	84·0
Lettuce	1	.....	.....	63·0
Parsley	1	.....	.....	54·0
Parsnips	1	.....	.....	30·0
Pepper	1	.....	.....	52·0
Sugarcane	1	.....	.....	22.0
Sage	1	.....	.....	1·0
Sweet majoram	1	.....	.....	11·0
Thyme	1	.....	.....	6·0
Total number of samples tested, highest and lowest percentage and average vitality	1,370	100	0	85·9

LADOGA WHEAT.

For many years past the importance of obtaining the earliest ripening varieties of grain which the world could furnish for test in the Canadian North-west, had impressed itself on the minds of many of those who took an interest in that country. In 1882 when the late Charles Gibb, of Abbotsford, Que., visited Russia in company with Pro. J. L. Budd, of Iowa, for the purpose of inquiring into the character and hardiness of the fruits grown in the northern parts of that country, he made inquiries also regarding the early ripening varieties of wheat to be found there. Having carefully studied the character of the climate, he ascertained that the season was short and that the climatic conditions in some parts of Russia closely resemble those which obtain in districts in the North-west Territories of Canada, and finding that some of the wheats in cultivation there ripened very early, he endeavoured to procure samples to bring home with him, but did not succeed in obtaining them. In conversation with him after his return, information was obtained as to the localities and sources where the most promising of the early ripening wheats would probably be found, and as soon as the experimental farm system was inaugurated, early in the winter of 1886, correspondence was opened with a noted seed dealer in Riga, Russia, Mr. E. Goegginger, who had made a special study of Russian cereals. Samples of the best Red Fife obtainable were sent to him, and he was requested to select from the varieties grown north of Riga, the earliest sort or sorts to be found, and if possible equal in quality to the best Red Fife. He was also requested to interest himself in obtaining for test on the experimental farms samples of other varieties grown as

far north in that country as the cultivation of wheat extended, so that opportunity might be had for testing here all the more promising sorts to be found in Northern Russia, with the hope of finding among them a hard wheat of good quality, which would ripen early enough to escape the autumn frosts, which sometimes injure the crop in some parts of the North-west country.

The variety which Mr. Goegginger recommended as most likely to meet the requirements of the case was the Ladoga, grown in latitude 60 near lake Ladoga north of St. Petersburgh and by latitude 600 miles north of the city of Winnipeg. This variety is said to be highly esteemed in Russia both for its quality and earliness. One hundred bushels of this wheat were ordered and received in Ottawa early in the spring of 1887, when samples were submitted to some of the leading millers and other expert judges who pronounced it to be a promising wheat which they believed would grade almost as high as No. 1 hard. The kernel was plump, longer than Red Fife but not so bright in colour and it weighed 61 lbs. per bushel. Samples of this grain weighing three lbs. each were distributed for test without delay to farmers in different parts of the Dominion, 277 of which went to Manitoba and the North-west Territories and 1,200 lbs. was forwarded by the Commissioner of Indian affairs to be distributed among the Indian agencies.

The demand from the North-west for samples of this grain was large and it was found necessary to order another 100 bushels from Riga which was received early in the spring of 1888. 275 reports were received from farmers who had tested the Ladoga in 1887, and 301 from those who tested it in 1888, and these show that the Ladoga had ripened on the average ten days earlier than the Red Fife wherever tested. A bulletin was issued on this subject (No. 4) in March, 1888, giving particulars of such information as was obtainable regarding this wheat to that date.

In order to form a correct judgment as to the quality of this grain as grown in this country, opinions were sought from the most competent judges and boards of experts in the Dominion. The most prominent among the Dominion grain inspectors, the largest millers, and the Boards of Trade at Montreal, Toronto and Winnipeg were all consulted. Eleven samples of Ladoga, four of which had been grown in Manitoba, four in the North-west Territories, and three in the Maritime Provinces, were selected for scrutiny. The samples sent to each were all out of the same bags, they were sent just as they were received from the growers; information was given as to the name of the variety, the names and addresses of the parties who had grown the samples, and an opinion asked for as to how these samples would grade in the markets of this country, if offered in quantity, and how they would compare in value with Red Fife. With reference to the purpose of this introduction, I quote the following from the letter which accompanied the specimens, "the object of this introduction is not by any means to displace the Red Fife. I think the growth of that variety should be encouraged in every practicable way, but the Minister of Agriculture desires that an earlier wheat of good quality should be secured to be grown where the Red Fife does not succeed, and thus discourage and prevent as far as is practicable the introduction of soft and inferior varieties of wheat, so that the present high standard of our North-west grain may be generally maintained." The opinions given on these samples, which were identically the same in each case, were most varied and conflicting. The same sample was pronounced "hard" by one board of experts, "soft" by another, "hard" by a third, but "worth 5 cents a bushel less than No. 1 hard," while a fourth judge pronounced it as "extra No. 1 hard."

Samples of the same lot were submitted for analysis to Mr. F. T. Shutt, Chemist of the Dominion Experimental Farms, and the results of his analyses published in Bulletin 4 show that the better samples of Ladoga contained as large a percentage of gluten as the best Red Fife, and the quality of a hard wheat is believed to depend mainly on the proportion of gluten it contains.

In November, 1888, sixteen bushels of Ladoga wheat which had been grown at the Experimental Farm at Indian Head were taken to the roller mill at Fort Qu'Appelle, N.W.T., with a similar quantity of Red Fife which had been grown in an adjacent field. The flour of the Ladoga, when compared with the Red Fife, was

found to have a yellow shade. Several sacks of flour from both these varieties were forwarded to Ottawa, and bread carefully made from each under my own supervision. The Ladoga was found to produce a drier flour than the Red Fife, and 100 lbs. of the Ladoga flour produced 2 lbs. more of bread than the same quantity of the other. The bread made from both samples had a yellowish tint, but the yellow colour was more pronounced in the bread made from the Ladoga flour. Samples of this bread were submitted to the members of the Committee on Agriculture of the House of Commons, then in session, and both pronounced of good quality

A sack of each sort of flour was sent to two of the leading bakers in Ottawa, who tested it carefully and submitted reports. One stated that the Ladoga was a stronger flour than the Red Fife and would make more bread to the barrel, but the colour of the bread made from it was not so good; the other was also of opinion that the Ladoga was the stronger flour of the two, but being darker in colour would not command so high a price as the Red Fife. Samples of the bread made from the Ladoga were sent to a number of people of good judgment in Ottawa, by whom it was pronounced to be of good quality.

In summing up the evidence brought together in Bulletin 4 I used the following words, which I thought were justified by the facts presented:—"The better samples of Ladoga are fully as rich in gluten as the best Red Fife, and while the cultivation of the Red Fife should be recommended in every section of the North-west, where it is likely with early sowing to escape the autumn frosts, the growth of the Ladoga may be safely encouraged wherever the ripening of the Red Fife is uncertain, without incurring the risk of materially lowering the reputation or the general quality of Canadian hard wheats."

In the annual reports of the experimental farms for the years 1889, 1890 and 1891 further particulars were given of the testing of this wheat, and it is shown that the quality of early ripening has been maintained throughout. Many efforts were made during the past two years to secure a sufficient quantity of Ladoga to make a thorough test at one of the larger mills as to the quality of the flour which could be made from it, as the early tests made in a small way were held to be insufficient and unreliable. Finally, Messrs. McLaughlin & Moore, of the Royal Dominion Mills, of Toronto, agreed to make a thorough test if a carload of this wheat could be procured for the purpose. On learning that it could be got in the Prince Albert district, where some of the farmers had grown Ladoga very successfully for several years, Mr. A. Mackay, Superintendent of the experimental farm at Indian Head, was requested to visit that locality early in the year and purchase the necessary quantity of pure Ladoga. This reached Toronto early in April, and on the 28th of that month the grinding was begun. I was present during the greater part of the day and saw the working of the wheat and was satisfied that the test was fairly conducted.

Several of the leading bakers in Toronto were supplied with the flour and several tests were made with it, and our chemist, Mr. F. T. Shutt, was sent to Toronto to be present at some of these tests. The following report has been submitted by Mr. Shutt:—

WM. SAUNDERS, Esq.

SIR,—I beg to report as follows, regarding the Ladoga baking test conducted in Toronto last May.

The wheat was ground by Messrs. McLaughlin & Moore, Royal Dominion Mills, Toronto. In an interview, Mr. McLaughlin expressed himself respecting the milling of Ladoga and the quality of the flour in the following terms: "Compared with Red Fife it grinds 'tough,' reducing the capacity of the mill—thus the output per hour was

Ladoga	16·3 barrels.
Red Fife	18·1 "

"These results, however, would not have been so adverse to Ladoga if the mill were run with it, say for a week. The present trial was for nine hours only. The cleaning process or separation of bran is more difficult in the case of the Ladoga,

though in this respect as well as in the grinding it ranks ahead of 'goose' wheat. It would yield about the same quantity of flour per bushel as No. 1 Hard, in which also the percentages of 'Bakers strong' and Low grade are similar to those from No. 1 Hard. It contains about the same percentage of gluten as No. 1 Hard. The flour is yellow compared with that from No. 1 Hard. Doubtless the flour would give better results after being allowed to age."

Through the courtesy of Mr. J. D. Nasmith, baking trials were made at his bakery, Adelaide street, Toronto.

The first three experiments were conducted by Mr. Nasmith on 4th, 5th and 10th May. He found that the third trial yielded much whiter bread than the first, owing to a modification in the method and time of working the sponge and dough. Mr. Nasmith obtained bread from Ladoga, at the third trial, which but for a slightly yellow tinge he considered equal to that from "Queen" (Patent) brand. He further is of opinion that it is a strong flour, and that the yellow colour may be dissipated to a great extent by allowing fermentation to proceed longer than usual. The sponge of Ladoga works quicker than that of Red Fife. In a comparative test, Mr. Nasmith obtained from 100 lbs. of "Queen" flour, 147 lbs. of bread; from 100 lbs. of "Ladoga" flour, 152 lbs. bread.

The following trials were made under my own supervision. The weights of flour, yeast, salt and water used, as well as of the sponge, dough and bread were carefully recorded. The baker used a sufficient quantity of water, according to his own judgment, to bring the sponge and dough in each case to the right consistency: the weight of the water used being noted. The sponge in each case was set for eleven hours, the initial temperature being 76°F. The temperature of the bake-house ranged from 70° to 72°F. throughout the night.

The "Queen" brand. This rose well in the sponge and "improved" in the pans, and the bread was very satisfactory in all respects. From 100 lbs. of flour, 140 lbs. 8 oz. of bread were baked.

The Ladoga flour.—At the end of the setting period (11 hours), the sponge was much "slacker" than that of the "Queen." It had evidently been allowed to ferment too long and had become "spent." It would not "improve" or rise in the pans and the resulting bread was yellow and "flat" compared with that from the Queen flour. From 100 lbs. of the flour, 145 lbs. 13 oz. of bread were obtained.

I would very briefly sum up as follows:—

1. That it is evident that the right conditions for obtaining the best results in baking Ladoga are not as yet well understood. Good, well risen white bread has been baked from Ladoga flour which on another occasion has yielded flat, heavy, yellowish bread. The public at present demand a white bread, and it is chiefly on this account I think, that the bakers are averse to Ladoga flour—the bread from it usually having a yellowish colour.

2. The physical character of the gluten is different from that of the Red Fife. It is somewhat inferior in colour and elasticity, and is more sticky. Age would most probably improve its quality. In percentage of gluten, however, it is fully equal to Red Fife—see Bulletin 4, Experimental Farm series.

3. The Ladoga is drier and consequently takes up more water and yields a larger weight of bread than the Red Fife flour. This I surmised from my analyses of the Red Fife and Ladoga flours given in the Bulletin above mentioned.

Your obedient servant,

FRANK T. SHUTT,

OTTAWA, January 2nd, 1893. *Chemist, Dominion Experimental Farms.*

On 9th of May Mr. McLaughlin wrote as follows:—"Mr. Coleman has tried the flour, so has Mr. Nasmith, but neither have yet made tests satisfactory to themselves. So far as we have seen of the bread it looks as if the colour was going to prove very yellow and the strength better than we anticipated, but nothing positive can be said until these bakers have made satisfactory tests." On the 10th he says: "In our yesterday's letter we said that so far as we had yet seen of the Ladoga bread it was going to prove very yellow. To-day we have samples from both bakers which are surprisingly different from the samples on which we based the "very

yellow" opinion. Mr. Nasmith, I think, intends sending you some loaves of bread which if they reach you in good order, will do something to confirm your faith in Ladoga. We shall not venture any further opinion until the bakers have made their final tests." On the same day Mr. J. D. Nasmith writes as follows:—"I sent you to-day by express three loaves, two from the Ladoga flour, the other one is from McLaughlin's 'Queen.' The first comparative trial a week ago was surprising, establishing strength enough, but such a very yellow colour as I never saw before in bread. To-day's sample if it reaches you in time, I know will gratify you as it did me, I did not at all anticipate such results from first trial." When this bread arrived I was absent from home and did not return for several weeks when the bread was spoilt. Those who saw it and tested it while fresh pronounced it excellent.

Nothing further was heard on this subject until 14th June, when Mr. McLaughlin wrote again as follows:—"We have now had sufficient experience with the Ladoga flour to satisfy us that it is never going to be a favorite with bakers. Nasmith has not been able to repeat the loaf he sent you, and Coleman condemns it in unstinted terms, a third man, B. Woodman of Parkdale, to whom we sent some had quite as bad an experience as Coleman. These are the only three to whom we have sent the flour. Certainly the bread—all but that one sample of Nasmith's—was unfit for Toronto trade."

Mr. McLaughlin's final report on this subject was written on the 25th August and reads as follows:—

TORONTO, 25th August, 1892.

Prof. WM. SAUNDERS,
Director of the Dominion Experimental Farms,
Ottawa.

DEAR SIR,—On the 28th April last, we ground 600 bushels Ladoga wheat shipped to us from Prince Albert, N.W.T.

The wheat was in good condition, fairly plump, free from smut or frost and very uniform.

In grinding it worked quite different from ordinary Manitoba hard wheat, being harder to reduce and requiring more power. In this respect it resembled goose wheat more than any other variety.

We sent some of the "Patent" and some of the "Strong Bakers" flour to different bakers in Toronto, telling them what it was, and requesting them to be as careful in their baking tests as we had been in milling it.

In every test the flours were pronounced inferior to the flours from ordinary No. 1 and No. 2 hard Manitoba wheat.

In all cases the deficiency in strength, the very yellow colour, and the coarse texture of the bread were the evils complained of.

No baker who tested it could be persuaded to buy the flours afterwards, even at a considerable reduction in price from the price of flours similarly made from No. 2 hard Manitoba.

Later tests, after the flours had been six weeks old, resulted no better.

Baked as household flour, the Ladoga Patent and Strong Bakers worked fairly and made bread that was up to the quality of much that is used in some places, but not good enough for people who are particular as to appearance as well as taste.

Our different experiences with this flour lead us to this conclusion:

Good unfrosted Ladoga wheat, such as the lot we ground, will make better flour than No. 2 regular Manitoba wheat, but not as good as No. 1 regular Manitoba.

We still have some of both grades of the Ladoga flour on hand, which we would be pleased to dispose of to anyone who wished to test it further.

We are yours very truly,
McLAUGHLIN & MOORE.

From the facts submitted it would appear that while it is possible to make good bread from Ladoga flour it is much easier to make bread of an inferior quality, and unless the proper methods for treating this flour to procure uniformly good results

could be ascertained it is not likely that Ladoga will be acceptable either to millers or bakers as long as the flour of the Red Fife is obtainable. Hence wherever Red Fife can be ripened, the efforts of those settlers engaged in wheat growing should be directed to its production in the greatest perfection by early sowing and a proper preparation of the soil. It is to be regretted that the Ladoga wheat has not in quality more fully realized the hopes which were first based on it. Since Bulletin No. 4 was published it has been found that the gluten in different varieties of wheat, although responding alike to chemical tests, varies in its physical properties of toughness and elasticity and that in these particulars, the gluten in Red Fife is superior to that in most other wheats.

The presentation of this case of the Ladoga would not however be complete without quoting from some of the letters which have been received in favour of this grain. It is undoubtedly a week or ten days earlier in ripening than Red Fife and there is no early variety among all the spring wheats which we have tested which has more good points than Ladoga. Some of the varieties imported from India are as early, but they are such poor yielders that no farmer would care to grow them, and no sufficient quantity has been grown here to admit of their being tested by the millers. Many cross-bred varieties have been produced at the Central farm, between Red Fife and these early sorts with the hope of originating new wheats equal in quality to Red Fife and earlier. Until these new sorts are multiplied and their relative value ascertained, settlers in the Canadian North-west would do well to devote their attention to the growing of Red Fife, and place it under such conditions as to give it every chance of maturing since no other wheat is yet to be had which will give the same satisfactory returns, both for home and foreign trade.

As samples of testimony from settlers and others in favour of Ladoga the following are submitted and many more such might be given. Mr. John Eccles of Stony Plain, Edmonton, North-west Territories, writes on March 7th, 1892, as follows: I sowed a couple of acres of Ladoga last year on the same day as my Red Fife, and reaped it 14 days earlier. It was a splendid crop perfectly free from smut. I consider it a first class wheat, I had a grist ground at the mill, and I never want a better quality of flour, notwithstanding the reports to the contrary.

Mr. Henry H. Hayward, of Hayward, Assa., writes under date of March 26th, 1892, and says: "In the spring of 1889, I sowed a 3 lb. sample of the Ladoga wheat which you were kind enough to send me, and in the fall of last year 1891, I threshed 174 bushels, the result of the 3 lb. sample. The 19th of this month I took to the roller mills at Fort Qu'Appelle, 51 bushels to be tested as to what sort of flour it would make. The amount I received in flour was 38 lbs. of the best, and about 3 lbs. of poor grade per bushel of 60 lbs. I may say that the sample of wheat was a fair one, there being no trace of smut in it. The grain was much lodged by a storm which caused great waste in harvesting, yet I threshed 35 bushels to the acre:" a sample of the flour was sent by Mr. Hayward of that part of the grist which was supposed to be perfectly pure and it appeared to be very good but a little yellow in colour.

Mr. Alex. McGibbon, Inspector of Indian agencies, writes on November 12, 1892, from Onion Lake Reserve, 100 miles north west of Battleford, and says: "I take the liberty of sending you a sample of Ladoga wheat, grown on this agency. It was tried for the first time this year. The Indian fields gave a return of 12 bushels per acre, but it was badly damaged by gophers, the season being very dry. Half an acre sown by the agent in his own field and which received attention gave a return at the rate of 44 bushels per acre. The whole of this lot is equal to the sample I send you. It was sown on the 22nd of April and harvested on the 3rd of September." The sample sent by Mr. McGibbon was very fine and plump.

The agent at Onion Lake Reserve, Mr. G. G. Mann, in a recent report to the Department of Indian Affairs says: "All the wheat was saved without damage by frost, the yield being very poor with the exception of the few bushels of Ladoga wheat which turned out fairly well. In consequence of this I have asked in my 1893 estimates for a supply of 200 bushels of Ladoga for seed which if supplied will I am certain turn out very well as it ripens so much earlier than the old grade of wheat

there would be no danger from frost. " Favourable reports have also been received from other Indian agencies in the north concerning the sucessful growth of this wheat.

I am indebted to Mr. C. C. Chipman, Commissioner for the Hudson Bay Co., for the privilege of sending to a number of the posts of that company in the far northern districts of the Dominion samples of grain of one pound each for test and report. These were sent in the autumn of 1891 to be grown in 1892. The officer in charge of Fort Vermilion, Athabasca district, about 520 miles north-west of Calgary, writes as follows. The seed was sown on the 14th of May last and harvested on the 23rd of August. There was no rain whatever for three weeks after the seed was sown. The Red Fife did not head out at all, the yield of the Ladoga was 12 lbs., weighing 60 lbs. per bushel. Bonanza oats, 9 lbs.; Prize Cluster oats, 7 lbs.; Rennie's improved six-rowed barley, 16 lbs; Spring rye, 18 lbs. Through the kind courtesy of Mr. Chipman I have received samples of these different sorts of grain.

Samples have also come in from the same source from Fort Simpson in the Mackenzie River District, about 750 miles north-west of Calgary. The officer in charge of that post writes as follows: " The kinds of grain sown were Ladoga wheat, Rennie's six-rowed barley and Bonanza oats. The two latter never ripened, but the wheat yielded 12 lbs, of good ripe grain. The date at which these varieties were planted here was the 7th of June and the wheat was harvested on September 22nd." The Ladoga in this instance weighed 62¼ lbs. per bushel.

A very fine sample of Ladoga wheat was received last year grown at Dunvegan in the Peace River District, about 340 miles north west of Calgary, which weighed 64 lbs. per bushel. A sample has also been received grown at Isle à la Crosse, about 170 miles north of Prince Albert, weighing 64 lbs. per bushel. No other wheat has ever given such results as these in those distant northern regions. While these tests and experiments with the Ladoga have been in progress, a large acreage has been devoted on each of the Experimental Farms at Indian Head, North-west Territories and Brandon, Manitoba, to the growth of pure Red Fife, for the purpose of supplying farmers whose seed had become mixed, with pure grain for a fresh start; and it is proposed to continue this work on a still larger scale in future, so that the means may be afforded of renewing the stock of this valuable grain from time to time from a pure source. Many farmers in the west have had forwarded to them from Ontario during the past few years, samples of eastern soft wheats for trial, and in this way White Russian, Colorado, Red Fern, Golden Drop and other varieties have been introduced and in some localities grown to a considerable extent. Although these varieties soon harden in that climate and some of them are then difficult to distinguish from Red Fife, they do not contain the quality of gluten which is found in the Red Fife; and any considerable admixture of any inferior sort will sooner or later lower the character and probably reduce to some extent the price paid for hard wheats. It has been supposed by some people who have not inquired very closely into the matter and who are not conversant with the peculiarities of the different varieties that all the soft wheats grown in Manitoba and the North-west Territories are Ladoga. The Ladoga is not and never has been in our experience a soft wheat and there is no doubt that the quantities grown in the North-west of the other varieties referred to far exceed the quantity of Ladoga which has been produced. While the idea of growing Ladoga wheat as a competitor with Red Fife for export or the general home trade, should be abandoned, there is no doubt that the flour of the Ladoga makes excellent and nutritious bread for home use, and where wheat growing is carried on in the more northern districts in a limited way for home consumption, and where Red Fife seldom ripens, or on the Indian Reserves where a yellow tint in the bread is not a matter of so much significance, the Ladoga wheat will still prove a most useful and desirable variety.

HUNGARIAN WHEAT AND FLOUR.

For some time past inquiries have been in progress as to the reason why the best Hungarian flour uniformly commands in the markets of Great Britain a higher

price than the best Canadian or American. Efforts have also been made to secure samples of the best Hungarian wheat for test in this country, but since all the Hungarian wheat is ground at home and the flour only exported these endeavours have not yet been successful. In September last my assistant in experimental field work, Mr. Wm. T. Macoun, visited Europe and was requested to make some inquiries into this subject and endeavour to procure samples of the grain, and through his efforts it is expected that a small supply will be available in time for spring sowing. He was also requested to visit the experimental grounds at Rothamstead and Woburn, also those of Vilmorin and Andrieux, near Paris, France. On his return he submitted the following report:—

Prof. Wm. Saunders,
Director, Experimental Farms.

Dear Sir,—In accordance with instructions received from you I made inquiries, while in Liverpool, regarding the Hungarian flour.

I went to the Canadian Office and presented your letter of introduction, but Mr. Dyke, having sailed for Canada, the letter was given to Mr. Mitchell who kindly took me to H. C. Woodward, an expert in grain.

Mr. Woodward told me that it was not because the Hungarian flour was manufactured from a better wheat than others that it commanded so high a price on the market, but that Hungary was one of the first, or the first country to introduce the improved apparatus for making flour; and that, having a reputation of long standing, the flour was sought for by customers who had used it a long time, and that the supply not equalling the demand the price was necessarily higher. He did not think that the Hungarian wheat would have any advantage over our own wheats, which produced strong flour.

When, in London, I called at the Canadian Office and presented your letter of introduction to Mr. Colmer, who gave me a letter to Mr. R. Dunham of "The Miller." Mr. Dunham said that he knew the Hungarian flour well; that it was stronger than the Red Fife or other milling wheats, and that it would make more weight of bread, from a given quantity of flour, than other varieties. The Red Fife, he said, made a higher loaf, the quality of the gluten being different. He said also that the kneaders in the bakeries in England get small pay, and will not work hard enough to put the amount of strength into the kneading that is required, the Hungarian being harder to work, and that from this cause the bakers do not buy it, hence the slow demand. He believes that the climatic conditions of that part of Hungary from which the flour comes are better than Manitoba or the North-west, and that the wheat is better on this account than our own. None of the Hungarian wheat is imported into England, but Mr. Dunham promised to send me a pound, which he had, to my boarding house in London, but this did not reach me. He expressed his willingness to obtain some for you from Hungary if so desired.

After having obtained the above information, I thought it advisable to visit the office of R. Hunter Craig & Co., flour importers and dealers in Hungarian flour, whose price lists I had with me.

They told me that the reason the Hungarian flour commanded such a high price is that the best flour only is imported, the natives using the poorer grades. The Hungarians also make more grades of flour than other millers, their machinery is excellent, and the flour is strong.

The demand is slow in England because the buyers are content with other sorts of flour which, though somewhat poorer than the Hungarian, make excellent bread. I was also told that the supply was not scant, but that plenty could be got. The wheat, they thought, must be good. They kindly furnished me with samples of the first and second grades of the Hungarian flour. I was told also that they believed that the Hungarians were much more particular in selecting their wheat for milling than the Canadians or Americans, and that for this reason the quality of the flour was improved.

Visit to Rothamsted.

On September 8, I visited Rothamsted, the home and experiment grounds of Sir John Lawes. Unfortunately he was absent in Scotland, and Dr. Gilbert also was about to leave, but he kindly provided me with a guide who was well acquainted with the work that was being carried on.

We first visited the sample room containing some thousands of samples of soil and grain which had been taken from the various plots, year after year up to the present time, for analysis.

On the way to the laboratory some boxes containing leguminous plants were pointed out to me. These boxes were so constructed that at any time the roots could be exposed and photographed. This was in connection with experiments made to prove the fixation of free nitrogen by the nodules of the roots of the leguminous plants.

No chemical work was being carried on in the laboratory, as the chemists were away. There was an interesting exhibit of grasses here from fertilized plots, which were, at one time, part of a meadow. The influence which various fertilizers had in producing more or less growth, according to the kind and quantity used, on the varieties of grasses and plants of which the original meadow was composed, was clearly shown. The mineral fertilizers seemed to increase the growth of leguminous plants in a very marked degree.

We visited a small glass house where a few pots of clover were placed. The soil in the first was pure sand, the second was pure sand with a very small quantity of garden soil, and the third garden soil. The reason why the garden soil was put in the second pot was to start the plants growing and the further growth was expected to be caused by the fixation of the free nitrogen of the air by the root nodules. Certainly the plants in the second were far ahead of those in the first pot, there was much more difference than the slight amount of garden soil could cause.

We visited next the rotation field, mangels being the principal crop this year. These plots have had various fertilizers for years. Certainly the unfertilized plot did not amount to much.

The next point of interest was the gigantic rain gauge $\frac{1}{1000}$ of an acre in diameter; also a drain gauge of the same size showing what percentage of water percolated through the soil. We then came to the root field in which were plots of mangels having various fertilizers, and next to the permanent grass plots from which the samples of grass already mentioned had been taken. It was remarkable how much the fertilizers had changed the character of the herbage, some plots having large quantities of leguminous plants while in others they had nearly disappeared.

The grain fields were also visited but they had been bereft of their crop and the land was partly ploughed.

In the middle of each plot and running lengthwise from one end to the other was a tile drain. The outlet is left open and the water analysed to find how much of the fertilizer drains through the soil. Nitrates, fall sown, drained away to a very large extent before spring. The effects of an application of farmyard manure seemed to be felt long after that of artificial fertilizers.

The soil of Rothamsted is a clay loam and many of the fields are thickly bestrewn with small flint stones.

Visit to Royal Agricultural Society's Experiment Grounds, Woburn Sands, Eng.

On Sept. 9th, I took the train from London for Woburn Sands, about 50 miles distant.

There are about 40 acres under experiment here, and Mr. A. E. Elliott is in charge. He kindly showed me what was of interest, but the grain having been harvested there was not very much to see. There were, however, a few $\frac{1}{10}$ acre plots of wheat in the field which had been grown to test the relative yield of the different varieties. These were not very good samples having been hurt by rain.

An experiment with a mixture for the prevention of potato rot was being carried on, but as the potatoes had not been dug, I could not get any results. The

mixture was applied on early, medium, and late potatoes. One section of each plot was treated, shortly after the potatoes were up, another when the potatoes were well grown but showing no signs of rot, another when the vine showed the first signs of decay, The following are the two mixtures used :

1st. 20 lbs freshly burned lime.
20 lbs sulphate of copper.
20 lbs molasses.
100 gals. water.

2nd. Same as the first without the molasses.

The plots were of three sizes: $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{3}{4}$ of an acre.

A few steers are fed during the winter on different rations.

The different sorts of grain when harvested are kept separate while stacked, with oat straw which can be readily distinguished from the wheat straw. When threshing, a large rick sheet is placed under the threshing machine and after each sample is put through, the machine is kept running for some minutes after the last of the grain has been taken out in order to clean it thoroughly. The sheet under the threshing machine is also carefully swept each time.

The soil is of a dark sandy loam.

The experiments with fertilizers at this station are the same as those which are being carried on at Rothamsted.

Visit to Experimental Grounds of H. Vilmorin, Esq., Verrières, France.

On October 10, I visited the office of Vilmorin & Andrieux, rue de la Mégesserie, Paris. I saw Mr. H. Vilmorin, presented your letter, and he kindly invited me to visit his experiment grounds at Verrières, about ten miles from Paris. Accordingly, early the next morning I took the train from Paris to Massy, and from Massy station to Verrières by conveyance.

Mr. Vilmorin has 100 acres of land at this place, where he resides with his family during the summer.

Seeds of all sorts intended for future distribution are originated on this estate. As soon as a sufficient quantity of a new variety is obtained it is sent to various farmers throughout France to be multiplied, and afterwards samples of each growing are finally tested at Verrières, and their purity, trueness to type, germinating power and good points noted, and such as are found to be suitable for further distribution are placed in stock for market.

In going over the grounds we passed small grass plots, also plots of celery, carrots, mangels, beets, turnips and cabbages. The roots were just being dug, and they were laid in rows while one of the employees took notes of the percentage of well and ill-shaped specimens, also of size, etc.

Mr. Vilmorin showed me very many specimens of cross-bred grain, of which there were some remarkable types: some resembling spelt wheats when neither of the parents were of this class, and some having black beards while the parents had not, and many like curiosities.

He said that he did not know any plan for shortening the period of fixing types, but he discarded all those that sported much, even though they were promising sorts, retaining those that either did not sport or sported very little, if they were promising.

He had never succeeded in making any crosses between two and six-rowed barley, but believed it could be done, he did not believe that wheat and rye could be hybridized.

His large collection of grain is very interesting. He has also a laboratory where considerable work is done in analyzing beets to ascertain the percentage of sugar.

Yours respectfully,

WM. T. MACOUN.

FORESTRY.

The question of tree planting for shelter for buildings, stock, fruit and vegetable gardens and crops generally, is attracting increased attention from year to year, and information is being sought on the subject from every quarter, but more particularly from those parts of Canada where trees are scarce or wanting. To stimulate and meet this spirit of inquiry, there has, during the past four years, been sent from the Central Experimental Farm about 5,000 bundles of young trees, about 100 in each package, consisting mainly of very hardy sorts with a few less hardy varieties added for test. These have been distributed mainly among farmers residing in those parts of the North-west plains, where the want of trees is most urgently felt. Experience has shown that the native trees succeed best, and at the outset these should claim almost the sole attention of the planter; but after some shelter has thus been provided, additional varieties may be more successfully introduced to give variety and added beauty to the plantation.

In the autumn of 1890 tree seeds were very abundant in the valleys and bluffs of Manitoba and the North-west Territories, and through the efforts of Messrs. Bedford and Mackay, the Superintendents of the Experimental Farms at Brandon and Indian Head, about three tons of these seeds were secured, chiefly of box elder or Manitoba maple (*Negundo aceroides*) and green ash (*Fraxinus viridis*). Large quantities of these seeds were sown on the western experimental farms, and from the plantations raised many thousands of young trees have been distributed among the settlers; besides this, 4,053 bags, each containing about a pound of seeds were sent by mail to farmers who applied for them with instructions as to sowing and care of the young trees. As a result of this action young plantations of trees are now to be found in every part of the North-west, which, in a very few years, will furnish most desirable and beneficent shelter, and at the same time adorn the homes of the settlers.

In 1891 a severe frost in the spring destroyed the blossoms on the native trees and seed was not obtainable that year, but, during the past season 1892, tree seeds have been again abundant, and the methods employed in 1890 have once more been put in operation, and another three tons have been collected. These are now being distributed in a manner similar to that adopted in the spring of 1891. The native trees in the North-west bear seed early, usually in about six or seven years from the time of sowing, and when these thousands of young plantations reach the degree of maturity necessary to produce seed, such tree seeds will be available in almost every district for enlarging and extending the area planted, and with the material thus available, an immense impetus will be given to tree planting. The large plantations which have been put out on each of the Experimental Farms will also yield annually a large quantity of such seed. In the appended report of the horticulturist, will be found some particulars of the distribution made during the past year.

To provide shelter and to add to the attractiveness of the Central Experimental Farm, as well as to give information as to the rate of growth in this climate of the different sorts of useful timber trees, large belts of young trees have been planted along the western and northern boundaries of the farm, which are making good growth. The avenues lining the principal roadways, the hedges also, and clumps of ornamental trees are all doing well.

METEOROLOGICAL OBSERVATIONS.

TABLE of meteorological observations taken at the Central Experimental Farme Ottawa, 1892; maximum and minimum temperature for each month, with dat, of occurence; also rainfall and snowfall.

——	Maximum.	Date.	Minimum.	Date.	Rain-fall.	Snow-fall.
	°		°		in.	in.
January	37·2	12th	−24·2	20th	·22	31·0
February	43·5	23rd	−16·8	14th	.....	26·0
March	42·3	28th	−10·0	16th	·22	21·0
April	66·4	28th	14·6	24th	1 83	.....
May	84·6	31st	31·0	1st	1·68	.....
June	90·3	13th	45·8	15th	6·19	.....
July	96·6	29th	44·5	5th	2·62	.....
August	87·5	18th	46·5	28th	4·21	.....
September	82·5	4th	33·5	8th	2·06	.....
October	70·2	14th	26 9	12th	1·45	.....
November	58·0	18th	13·2	23rd	3·12	6·0
December	36·9	15th	−18·3	26th	·18	21·0
					23 78	105·0

Rain or snow fell on 180 days during the year.

Heaviest rainfall in 24 hours, 1·96 in., on June 20th.

Heaviest snowfall in 24 hours, 8·00 in., on Feb. 8th and Mar. 11th.

During June rain fell on 23 days.

September shows the lowest number of days on which rain fell during the summer months, viz., 11.

WM. ELLIS,
In charge of observations.

CORRESPONDENCE.

The following is a summary of the letters received and despatched at the Central Experimental Farm during the year 1892:—

——	Letters Received.	Letters Sent.
Director	11,223	10,696
Agriculturist	3,489	3,116
Horticulturist	1,044	971
Chemist	722	733
Entomologist and Botanist	1,697	1,559
Poultry Manager	457	458
Accountant	1,224	1,009
	19,856	18,542

ACKNOWLEDGMENTS.

I desire again to bear testimony to the faithfulness with which all the officers and employees at the Central and Branch Experimental Farms have discharged their respective duties. The volume of work done at the several farms can only be partially presented in the annual report for want of space. The increasing demand

from year to year from farmers for copies of these reports may be taken as an indication of their value, and the estimation in which the work is held by those best capable of judging of its usefulness. For the details of the work submitted which has been done on the Central Experimental Farm, I am again largely indebted to the careful and accurate observations of my assistant in the experimental field work, Mr. W. T. Macoun and also to Mr. John Fixter the farm foreman, who in addition to the faithful discharge of his regular duties has taken daily notes during the growing season on the condition and progress of many of the varieties of cereals, field roots and other agricultural crops under test. To Mr. Wm. Ellis my thanks are also due for faithful services rendered in connection with the important work of seed testing and the care of a valuable collection of economic and other plants in the greenhouses under his care.

WM. SAUNDERS,
Director, Dominion Experimental Farms.

REPORT OF THE AGRICULTURIST.

(Jas. W. Robertson.)

To Wm. Saunders, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to report upon the progress of the divisions of the work at the Central Experimental Farm, which have been under my care during 1892.

These included, (1) some experiments in the feeding of cattle, (2) experiments in the fattening of swine, (3) experiments in the creaming of milk by different methods, (4) experiments in the making of butter, and (5) the growth of fodder crops upon the forty-acre lot for the feeding of cattle. As far as conclusions can be drawn from them at the present time for the information and guidance of the farmers of Canada, a brief record of these experiments has been presented in this report.

Experimental investigations have been in progress to discover the effect upon the quality, quantity and composition of the milk of cows, from feeding them upon rations of different and progressive degrees of richness in meal. A special bulletin on that subject will be issued after these investigations have been carried far enough to yield reliable information.

As had been the case during the two previous years, the duties of my office as Dairy Commissioner for the Dominion, occupied the greater part of my time. In that capacity I was called from home frequently, to visit the branch Experimental Dairy Stations, to inaugurate and supervise the work of travelling dairies, and to attend conventions of farmers and dairymen. In all thirty-six public conventions or meetings, of from one to three sessions each, were attended during the year. I also visited Great Britain with the main object of securing the introduction of Canadian winter-made creamery butter into the markets there in the best way. During the few weeks which I spent in England and Scotland, I was able to render other service, incidentally, to the agricultural interests of Canada. My report as Dairy Commissioner, which will be brought down to 30th June, 1893, will contain a fairly complete statement of the work which has been done and the progress which has been made.

The educational and experimental work of the Dairy Commissioner has been initiated now in all the provinces except British Columbia and the North-west Territories, upon lines which promise to lead to great financial benefit to the farmers in them, from the development of dairying. It has been my good fortune to be able to co-operate with the Departments of Agriculture of the several provinces and with the Provincial Farmers' and Dairymen's Associations, in joint efforts to improve the methods of dairy farming. My assistants in the Dairy Commissioner's branch of the work, have rendered most efficient service. In view of these facts, I am hopeful that I may be able hereafter to devote a larger share of my time to the work which may come under my charge at the Central Experimental Farm. For the faithful work which they have performed and the valuable assistance which they have rendered, I desire to mention with particular commendation, Mr. John Fixter, farm foreman; Mr. R. R. Elliott, herdsman, and Mr. Chr. Marker, butter maker and superintendent of experiments in the dairy building.

I have the honour to be, sir,
Your obedient servant,
JAS. W. ROBERTSON,
Agriculturist

PART I.—THE FEEDING OF STEERS.

Experiments in the fattening of steers were begun at the Central Experimental Farm in December, 1890. The main object of the first experiments, was to obtain information upon the relative cost of fattening steers, (1) upon a ration of which the bulky-fodder portion was mainly corn ensilage, hay and roots, (2) upon a ration of which the bulky-fodder portion was mainly hay and roots, and (3) upon a ration of which the bulky-fodder portion was mainly corn ensilage.

Six 2-year-old steers were purchased and were sorted into three lots, as nearly even in quality and size as possible. They were apparently all Shorthorn grades. On 1st December the average weight per head was 1,135 lbs. During the test (which lasted from 1st December to 18th May), they were weighed once every week and the feed they consumed was weighed every day. They had free access to water in a trough in front of the stalls, and a supply of salt was provided at the side of each manger. The preparatory period of feeding lasted from 1st December to 29th December, and during it all the animals were fed upon the same ration.

The three experimental rations were composed as shown in the following Table:—

TABLE I.

Ration No. 1.	Lbs.	Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Corn ensilage	20			Corn ensilage	50
Hay (cut)	10	Hay (cut)	20		
Roots	20	Roots	40		
Straw (cut)	5	Straw (cut)	5	Straw (cut)	5
Oil-cake	1	Oil-cake	1	Oil-cake	1
Cotton-seed meal	1	Cotton-seed meal	1	Cotton-seed meal	1
Pease (ground)	2	Pease (ground)	2	Pease (ground)	2
Barley (ground)	2	Barley (ground)	2	Barley (ground)	2
	61		71		61

For a period of five weeks from the 17th March to the 20th April, an additional 1 lb. each of oil-cake and cotton-seed meal were put into each ration.

For the purpose of obtaining some data which would be understood easily and remembered readily by the farmers, and which would afford means for making a comparison between the cost of feeding the steers on the three different rations, a cash value was estimated for the component fodders in each. The hay was valued at $8 per ton; roots (turnips and mangels) at $4 per ton; straw at $4 per ton; oil-cake and cotton-seed meal at $30 per ton; pease and barley at $20 per ton; and corn ensilage at $1.40 per ton. The corn ensilage was placed at the actual cost, as per statement in Bulletin No. 12, and the other fodders at an estimated valuation, which may be high or low, according to ever fluctuating circumstances of seasons and markets.

Table II shows, (1) the increase in weight of each steer after 20 weeks, (2) the average quantity of feed consumed per day per head, and (3) the average cost per head per day for feed consumed.

TABLE II.

RATIONS.		Increase in weight.	Feed consumed.	Cost per head per day
		lbs.	lbs.	cents.
No. 1.	Hay, roots, corn ensilage and meal	128	52·8	15·58
	do	182		
No. 2.	Hay, roots and meal	188	55·5	19·23
	do	179		
No. 3.	Corn ensilage and meal	221	60·	11·90
	do	212		

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 20 weeks, the steers which were fed upon ration No. 3, (corn ensilage and meal), gained in weight, on the average, 33 lbs. per head more, and cost 7·33 cents per head less, per day for feed consumed, than the steers which were fed upon ration No. 2, (hay, roots and meal);

(2.) During the feeding period of 20 weeks, the steers which were fed upon ration No. 3, (corn ensilage and meal), gained in weight, on the average, 61½ lbs. per head more, and cost 3·68 cents per head less, per day for feed consumed, than the steers which were fed upon ration No. 1, (hay, roots, corn ensilage and meal);

(3.) When the experiment was ended, the steers which were fed upon ration No. 2, (corn ensilage and meal) were in the most attractive condition of the three lots for handling and selling;

(4.) A ration of which the bulky-fodder portion was mainly corn ensilage, was more profitable for the fattening of steers, than a ration of which the bulky-fodder portion was mainly or wholly hay and roots.

EXPERIMENTS IN 1891–92.

The experiments in the feeding of steers during the winter of 1891–92, were planned,—

(1.) To obtain further information upon the relative cost of fattening steers upon a ration of which the bulky-fodder portion was mainly, (*a*) in the one case, corn ensilage, hay and roots, (*b*) in another case, hay and roots, and (*c*) in the third case, corn ensilage,—

(2.) To discover the comparative values of feed consumed, per 100 lbs. of increase in live weight, by 3-year-old steers, 2-year-old steers, 1-year-old steers and calf-steers respectively.

THE FATTENING OF TWO-YEAR-OLD STEERS.

Eight 2-year-old steers were purchased and were sorted into four lots as nearly even in quality and size as possible. They were apparently all Shorthorn grades.

The preparatory feeding period lasted from October 29 to December 1, and during it the animals were all fed upon the following ration:—

	Lbs.
Corn ensilage	25
Roots	50
Straw (cut)	15
Pease (ground)	3
Barley (ground)	3
	96

They were each allowed as much of the mixture as they would eat.

On October 29 the average weight per head was 1,079 lbs., and on December 1 it was 1,155 lbs., showing a gain of 76 lbs. per head.

Three rations were composed as in Table III.

TABLE III.

Ration No. 1.	Lbs.	Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Corn ensilage	20			Corn ensilage	50
Hay (cut)	10	Hay (cut)	20		
Roots	20	Roots	40		
Straw (cut)	5	Straw (cut)	5	Straw (cut)	5
Oil-cake	2	Oil-cake	2	Oil-cake	2
Pease (ground)	2	Pease (ground)	2	Pease (ground)	2
Barley (ground)	2	Barley (ground)	2	Barley (ground)	2
	61		71		61

For the purpose of making a comparison of the relative cost of fattening steers upon the three different rations, a cash value was estimated for the component fodders in each. The hay was valued at $8 per ton; roots at $4 per ton; straw at $4 per ton; oil-cake at $30 per ton; pease and barley at $20 per ton; and corn ensilage at $2 per ton. The corn ensilage was valued at a higher figure than in the former experiment (in 1890–91) for the reason that the corn was wilted to a greater extent before it was put into the silos, and because it cost more in 1891 than in 1890 owing to the crop being damaged by a hail storm in August. The prices at which the several fodders are valued for the purposes of this comparison are higher than the cost of production to the ordinary farmer, and may be higher or lower than the prices which could be realized from their sale as fodders.

The following Table shows, (1) the increase in weight of each steer in 18 weeks' (2) the total quantity of feed consumed on the average per head per day, (3) the average quantity of the meal mixture (included in the former) consumed per head per day, and (4) the average cost per head per day, for feed consumed.

TABLE IV.

RATIONS.	Increase in weight.	Feed consumed per head.	Meal in feed per day.	Cost per head per day.
	lbs.	lbs.	lbs.	cents.
No. 1. Hay, roots, corn ensilage and meal	152	61·96	6·09	18·28
No. 1. do do	265			
No. 2. Hay, roots and meal	165	53·92	4·55	18·22
No. 2. do	213			
No. 3. Corn ensilage and meal	260	67·92	6·68	14·47
No. 3. do	229			

THE FATTENING OF STEERS ON CORN ENSILAGE AND FROZEN WHEAT.

From December 1 until January 5, the other two steers were fed upon a ration composed of—

	Lbs.
Corn ensilage	50
Straw (cut)	5
	55

During that period, they gained in weight an average of 11 lbs. per head, and consumed on the average 61·9 lbs. of feed per head per day, at a cost of 6·75 cents per head per day.

From January 5 until April 5, these two steers were fed upon a ration composed of,

	Lbs.
Corn ensilage	50
Straw (cut)	5
Frozen wheat (ground)	6
	61

During that period of 13 weeks, they gained in weight an average of 159 lbs. per head, and consumed on the average 59·88 lbs. of feed per head per day, at a cost of 9·32 cents per head per day. The frozen wheat was valued at 35 cents per bushel.

Table V shows, (1) the average increase in weight per head per day, (2) the average cost per head per day for feed consumed, and (3) the average cost of feed consumed per 100 lbs. of increase in live weight.

TABLE V.

RATIONS.	Increase in weight per day.	Cost per head per day.	Cost per 100 lbs. increase in weight.
	lbs.	cents.	$
No. 1. Hay, roots, corn ensilage and meal	1.65	18·28	11 05
No. 2. Hay, roots and meal	1·50	18·22	12 14
No. 3. Corn ensilage and meal	1·94	14·47	7 45
No. 4. Corn ensilage and frozen wheat	1·74	9·32	5 33

Conclusions. From these tests it appears that:—

(1.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage and meal), gained in weight on the average 55½ lbs. per head more, and cost 3·75 cents per head less, per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots and meal);

(2.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage and meal), gained in weight on the average 36 lbs. per head more, and cost 3·81 cents per head less, per day for feed consumed, than the steers which were fed upon ration No. 1 (hay, roots, corn ensilage and meal);

(3.) The cost for feed consumed per 100 lbs. of increase in live weight, was 62·95 per cent greater on ration No. 2 (hay, roots and meal), and 48·32 per cent greater on ration No. 1 (hay, roots, corn ensilage and meal) than it was on ration No. 3 (corn ensilage and meal);

(4.) On ration No. 2 (hay, roots and meal) the quantity of meal consumed per head per day, was 4·55 lbs. as against 6·68 lbs. per head per day on ration No. 3 (corn ensilage and meal);

(5.) The quality of the beef, from the steers fed upon corn ensilage and frozen wheat, was pronounced to be particularly excellent by the butchers, and by the members of eight different households who examined it critically when served as roast beef.

NOTE.—To furnish further data for a comparison between the bulky-fodder portions of rations Nos. 1, 2 and 3, an equal quantity of meal per head per day, will be fed to the several animals in our next series of experiments, instead of equal quantities of meal being added to the different rations.

THE FEEDING OF THREE-YEAR-OLD STEERS.

Four 3-year-old steers were purchased and were sorted into two lots of apparently even quality. On December 3, the operation of dehorning was performed on them. The wounds on the heads of three of the animals appeared to be acutely painful for about a week, and during that time they all lost from 40 to 100 lbs. each. The other animal did not seem to suffer much, after the operation of sawing off the horns was ended. After the wounds were healed, the animals were fed loose in a cold shed with only one thickness of lumber between them and the outside air.

The preparatory feeding period lasted from October 29 to December 1, and during it the animals were all fed upon the following ration:—

	Lbs.
Corn ensilage	25
Roots	50
Straw (cut)	5
Pease (ground)	3
Barley (ground)	3
	96

They were each allowed as much of the mixture as they would eat.

On October 29, the average weight per head was 1,182 lbs.; and on December 1, it was 1,251 lbs.,—showing a gain of 69 lbs. per head.

Two rations were composed as in Table VI.

TABLE VI.

Ration No. 3.	Lbs.	Ration No. 5.	Lbs.
Corn ensilage	50	Corn ensilage	50
Straw (cut)	5	Straw (cut)	5
Oil-cake	2		
Pease (ground)	2		
Barley (ground)	2		
	61		55

For the purpose of making a comparison, a cash value was estimated for each of the component fodders in each ration as mentioned after Table III, page 58.

The following Table shows, (1) the increase in weight of eaeh steer in 18 weeks, (2) the quantity of feed eonsumed on the average per head per day, (3) the quantity of the meal mixture (ineluded in the former) consumed per head per day, and (4) the average cost per head per day, for feed consumed.

TABLE VII.

RATIONS.	Increase in weight.	Feed consumed.	Meal in feed per day.	Cost per head per day.
	lbs.	lbs.	lbs.	lbs.
No. 3. Corn ensilage and meal	102	65·96	6·48	14·05
No. 3. do do	155			
No. 5. Corn ensilage	50	54·65	0	5·96
No. 5. do	7			

THE FEEDING OF ONE-YEAR-OLD STEERS.

Four 1-year-old steers were purehased and were sorted into two lots of apparently even quality.

The preparatory feeding period lasted from 29th Oetober, to 1st December, and during it, the animals were all fed upon the following ration:—

	Lbs.
Corn ensilage	25
Roots	50
Straw (cut)	15
Pease (ground)	3
Barley (ground)	3
	96

They were eaeh allowed as much of the mixture as they would eat.

On 29th October, the average weight per head was 751 lbs.; and on 1st December, it was 805 lbs.; showing a gain of 54 lbs, per head.

From 1st December until 5th April, both lots were fed upon ration No. 3:—

	Lbs.
Corn ensilage	50
Straw (cut)	5
Oil-eake	2
Pease (ground)	2
Barley (ground)	2
	61

The two steers of one lot, were fed loose in a cold shed with only one thiekness of lumber between them and the outside air; and the two steers of the other lot, were fed tied in stalls in the eattle stable. The average temperature of the stable would be about 50° Fahr.

The following Table shows, (1) the increase in weight of each steer in 18 weeks, (2) the quantity of feed consumed on the average, per head per day, (3) the quantity of the meal mixture (included in the former), consumed per head per day, and (4) the average cost per head per day, for feed consumed.

TABLE VIII.

RATIONS.	How fed.	Increase in weight.	Feed consumed per head.	Meal in feed per head.	Cost per head per day.
		lbs.	lbs.	lbs.	cents.
Corn ensilage and meal	In stable.	173	45·25	4·45	9·64
do	do	163			
do	In shed.	172	43·94	4·32	9·36
do	do	129			

Conclusion. From this single test, it is not evident that there was an appreciable difference in the increase in the weight of the steers, or in the quantity of feed consumed, which was due to the place or manner of feeding,—stable *v.* shed, and tied *v.* loose.

THE FEEDING OF CALF-STEERS.

Four calf-steers were put under test on rations Nos. 2 and 3. Each lot contained one steer, out of a grade Shorthorn cow by a Shorthorn bull, and one steer out of a "Quebec Jersey" or "French Canadian" cow. The breeding of the sire of the Quebec steers was not known to us.

The preparatory feeding period lasted from October 29 to December 1, and during it the animals were all fed upon the following ration :—

	Lbs.
Corn ensilage	25
Roots	50
Straw (cut)	15
Pease (ground)	3
Barley (ground)	3
	96

They were each allowed as much of the mixture as they would eat.

On October 29, the average weight per head was 465 lbs.; and on December 1, it was 526 lbs., showing a gain of 61 lbs. per head.

The two rations were composed as in Table IX.

TABLE IX.

Ration No. 2.	Lbs.	Ration No. 3.	Lbs.
Hay (cut)	20	Corn ensilage	50
Roots	40		
Straw (cut)	5	Straw (cut)	5
Oil-cake	2	Oil-cake	2
Pease (ground)	2	Pease (ground)	2
Barley (ground)	2	Barley (ground)	2
	71		61

For the purpose of making a comparison, a cash value was estimated for each of the component fodders in each ration, as mentioned after Table III, page 58.

The following Table shows, (1) the increase in weight of each steer in 18 weeks, (2) the quantity of feed consumed on the average per head per day, (3) the quantity of the meal mixture (included in the former) consumed per head per day, and (4) the average cost per head per day, for feed consumed.

TABLE X.

RATIONS.	Breed.	Increase in weight.	Feed consumed per head.	Meal in feed per head.	Cost per head per day.
		lbs.	lbs.	lbs.	cents.
No. 2 { Hay, roots and meal.	Shorthorn	255	30·71	2·59	10·38
No. 2 { do	Quebec.	164			
No. 3 { Corn ensilage and meal.	Shorthorn	212	35·25	3·46	7·51
No. 3 { do	Quebec	175			

The following Tables have been arranged to show, (1) the relative rates of increase in weight, (2) the relative cost per head per day, and (3) the relative cost of feed consumed per 100 lbs. of increase in live weight, of the steers of Shorthorn and Quebec blood respectively.

TABLE XI.

—	Breed.	Weight Dec. 1.	Weight April 5.	Increase.
		Lbs.	Lbs.	Lbs.
Steer No. 174	Shorthorn	595	850	255
do 173	Quebec	480	644	164
do 172	Shorthorn	600	812	212
do 171	Quebec	430	605	175

TABLE XII.

RATIONS.	Breed.	Increase in weight per day.	Feed consumed per day.	Cost per head per day.	Cost per 100 lbs. of increase in weight.
		lbs.	lbs.	cents.	$
No. 2 { Hay, roots and meal.	Shorthorn	2·02	35·85	12·11	5·99
No. 2 { do	Quebec.	1·30	25·65	8·67	6·66
No. 3 { Corn ensilage and meal.	Shorthorn	1·68	39·00	8·31	4·94
No. 3 { do	Quebec.	1·38	31·50	6·71	4 83

Conclusions. From these tests with calf steers it appears that:—

(1.) During the feeding period of 18 weeks, the steers which were fed upon ration No. 3 (corn ensilage and meal) GAINED in weight on the average 16 lbs. per head LESS, and cost 2.87 cents per head LESS per day for feed consumed, than the steers which were fed upon ration No. 2 (hay, roots and meal);

(2.) The *cost* of feed consumed per 100 lbs. of increase in live weight, was 27.6 *per cent greater*, on ration No. 2 (hay, roots and meal), than it was on ration No. 3 (corn ensilage and meal);

(3.) The *cost* of feed consumed per 100 lbs. of increase in weight was *lowest* in the case of a calf steer of "French Canadian" or "Quebec Jersey" breed, fed upon ration No. 3 (corn ensilage and meal).

COMPARISONS IN THE FEEDING OF STEERS OF DIFFERENT AGES.

In the foregoing Tables some information has been given showing the comparative quantities of feed eonsumed and the cost per 100 lbs. of increase in live weight, by 3-year-old steers, 2-year-old steers, 1-year-old-steers and calf-steers respectively, when fed upon the same ration.

The following additional Tables have been arranged to present a eomparison of the results in convenient form. The lots which are compared were fed from Dec. 1 to April 5, upon ration No. 3, viz.:—

	Lbs.
Corn ensilage	50
Straw (cut)	5
Oil-cake	2
Pease (ground)	2
Barley (ground)	2
	61

TABLE XIII.

Steers.	Increase in weight.	Increase in weight per day per head.	Feed consumed per day per head.	Meal in feed per day per head.	Cost per head per day.	Cost per 100 lbs. of increase in weight.
	lbs.	lbs.	lbs.	lbs.	cents.	$
3-year-old, No. 189	102	1·02	65·96	6·48	14·05	13·77
do No. 188	155					
2-year-old, No. 183	260	1·94	67·92	6·68	14·47	7·45
do No. 182	229					
1-year-old, No. 178	173	1 33	45·25	4·45	9·64	7·23
do No. 177	163					
Calf steer, No. 172	212	1.53	35·25	3·46	7·51	4·89
do No. 171	175					

Conclusions. From this one series of experiments, it appears that:—

(1.) The *cost* for feed eonsumed per 100 lbs. of increase in live weight was *lowest* in the ease of calf-steers, viz.: $4.89 per 100 lbs.;

(2.) The *cost* for feed consumed per 100 lbs. of increase in live weight was 84·83 *per cent greater* by the 3-year-old steers than by the 2-year-old steers;

(3.) The original weight of the 2-year-old steers was enhanced *in value per lb.*, quite as much by the feeding for 18 weeks, as was the original weight of the 3-year-old steers;

(4.) The original weight of the 1-year-old steers and calf-steers was not enhanced *in value per lb.* to any appreciable extent by the feeding for 18 weeks.

NOTES.—The 1-year-old steers and calf-steers have been carried over to be fed during the winter of 1892-93.

The corn ensilage, which was used in these experiments, was made from several varieties of Indian corn, most of which had not reached the early milk stage of growth. By the planting of varieties of corn which ripen early (mainly Longfellow and Pearce's Prolific) a quality of ensilage which appears to be much superior, has been provided for the feeding experiments of 1892-93.

PART II.—THE FATTENING OF SWINE.

Experiments in the feeding of swine were eommeneed at the Central Experimental Farm in December, 1890. Particulars of the different sorts of feed, of the quantities of feed eonsumed, and of the increase in the live weight of the animals under the tests, were given in the Annual Report for 1891.

The objects of these first investigations were,—(1) to discover the differenee, if any, in the quantity of grain required to produce every pound of increase in the live weight of the swine, when it was fed steamed and warm, and when it was fed raw

and cold, (2) to obtain a record of the comparative quantities of grain required to produce every pound of increase in the live weight of swine during different stages of the fattening period.

The mixture of grain used in the tests was one composed of equal parts of pease, barley and rye, which had been ground. It was saturated with water and fed wet in all cases.

Cold water was given to drink, and a mixture of salt and wood ashes was put in a box on the floor of every pen, where the pigs had access to it at will.

The quantities of feed consumed were weighed every day, and the swine were weighed once every week.

The following Table shows the quantities of feed consumed per pound of increase in live weight, during six feeding periods in four pens.

TABLE I.

—	PEN 1.	PEN 2.	PEN 5.		PEN 6.	
	4 Swine, fed steamed and warm.	4 Swine, fed raw and cold.	4 Swine, fed steamed and warm, plus Sugar Beets.		4 Swine, fed raw and cold, plus Sugar Beets.	
	Grain.	Grain.	Grain	Sugar Beets	Grain	Sugar Beets
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
December 9 to January 5	3·31	3·30	4·69	0·61	3·17	0·84
January 5 to February 2	3·07	3·07	2·46	2·00	2·76	2·23
February 2 to March 2	3·79	4·43	3·46	2·00	3·81	2·32
March 2 to March 30	5·00	7·07	5·40	3·63	3·15	2·13
March 30 to April 27	7·06	5·68	4·88	4·08	9·51	8·25
April 27 to May 18	8·53	5·71	4·17	3·31	6.58	6·00
Average	4·16	4·25	3·86	+2·46	3·89	+2·73

Conclusions. These two sets of experiments indicate that:—

(1.) There is no appreciable difference in the number of pounds of grain required to produce a pound of increase in the live weight of swine, when it is fed steamed and warm, as compared with it when fed raw and cold;

(2.) On the average there is a gradual and great increase in the quantity of grain consumed for every pound of increase in the live weight of swine, after the second month of the fattening period, and after the average live weight exceeds 100 lbs.;

(3.) It is economical to market swine to be slaughtered when they weigh from 180 to 200 lbs., live weight;

(4.) The consumption of feed per day is *greatest* at or near the period of their fattening, when the quantity of feed consumed per pound of increase in weight, is *smallest.*

It may be added that to produce an increase of 3,231½ lbs. in the live weight of 24 swine, 4·14 lbs. of a mixture of equal parts of ground pease, barley and rye were required for every pound of increase in the live weight.

EXPERIMENTS IN FEEDING GRAIN, UNGROUND, GROUND AND WITH SKIM-MILK.

During the winter of 1891–2 experiments were begun to discover the effect of feeding swine upon a ration of grain only (unground and ground) as compared with a ration composed of grain and skim-milk. For the purpose, four pens of pigs were selected and sorted into lots as nearly alike as they could be obtained. In each of the four pens were put two pigs out of a Poland-China sow by an improved Large Yorkshire boar. With them were put three grade pigs in each of the three first pens; and in the fourth pen two pigs out of a Berkshire sow by an Improved Large Yorkshire boar, were put with the two cross-bred Poland-China-by-Yorkshire pigs.

The 9 grade pigs which were put in the first three pens with the 6 cross-bred Poland-China-by-Yorkshire pigs, were purchased outside. Their breeding was not known, but they appeared to be grades of Chester White, or Yorkshire blood. The pigs in the several pens, considered as lots, were as nearly as practicable equal as to breeding, quality, age and size.

The experiment began on January 4th and ended on May 2nd. The feed consumed was weighed every day, and the swine were weighed once every week. The following Tables have been arranged to show the average results at four different times in the fattening period.

TABLE II.

Pen 1 contained 5 swine, as described above—3 grades and 2 cross bred Poland-China-by-Yorkshire. They were fed upon a mixture of equal parts of pease, barley and rye, *not ground*, and soaked in cold water for 48 hours.

—	Jan. 1.	Feb. 1.	Feb. 29.	Mar. 28.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	346	386	502	646	780	.....
Increase in weight	.....	40	116	144	134	434
Feed consumed	.....	378	490	544	538	1,930
do per lb. of increase in live weight	.....	9·49	4·13	3·77	4·01	4·45

TABLE III.

Pen 2 contained 5 swine similar to those in Pen 1. They were fed upon a mixture of equal parts of pease, barley and rye, *ground* and soaked in cold water for 12 hours.

—	Jan. 4.	Feb. 1.	Feb. 29.	Mar. 28.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	346	430	580	741	865	.....
Increase in weight	.....	84	150	161	124	519
Feed consumed	.....	461	572	657	576	2,266
do per lb. of increase in live weight	.....	5·48	3·81	4·08	4·64	4·36

TABLE IV.

Pen 3 contained 5 swine similar to those in Pens 1 and 2. They were fed upon an allowance of the same mixture as those in Pen 2 (viz.: equal parts of pease, barley and rye, *ground* and soaked in cold water for 12 hours), plus all the skim-milk they would drink.

—	Jan. 4.	Feb. 1.	Feb. 29.	Mar. 28.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	346	434	590	768	1,017	.....
Increase in weight	.....	88	156	178	249	671
Feed consumed. Meal	.....	230	286	432	704	1,652
Feed consumed. + Milk	.....	1,081	2,078	2,649	3,537	9,345
do per lb. of increase in live weight. Meal	.....	2·61	1·83	2·42	2·82	2·46
do per lb. of increase in live weight. + Milk	.....	12·28	13·32	14·88	14·20	13·92

TABLE V.

Pen 4 contained 4 swine, 2 crossbred Poland-China-by-Yorkshire, and 2 crossbred Berkshire-by-Yorkshire. They were fed upon an allowance of the same mixture as those in Pens 2 and 3, (viz., equal parts of pease, barley and rye, *ground* and soaked for 12 hours), plus all the skim-milk they would drink.

—	Jan. 4.	Feb. 1.	Feb. 29.	Mar. 28.	May 2.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	306	395	520	675	842	.....
Increase in weight	.....	89	125	155	167	536
Feed consumed.. Meal	.....	332	385	514	626	1,857
Feed consumed.. + Milk	.....	610	481	551	938	2,580
do per lb. of increase in live weight. Meal	.....	3·73	3·07	3·31	3·74	3·46
do per lb. of increase in live weight. + Milk	.....	6·85	3·84	3·54	5·61	4·81

Conclusions. From these tests which continued 17 weeks, it appears that:—

(1.) 4·45 lbs. of grain were consumed per lb. of increase in live weight, when it was fed *unground* and soaked for 48 hours;

(2.) 4·36 lbs. of grain were consumed per lb. of increase in live weight, when it was fed *ground* and soaked for 12 hours;

(3.) 1 lb. of grain was the equivalent of 6·65 lbs. of skim-milk in increasing the live weight;

(4.) The swine, which were fed upon a ration containing skim-milk, were lustier and more robust in appearance, than those which were fed upon grain only.

EXPERIMENTS IN FEEDING FROZEN WHEAT.

The first test in this series was undertaken to discover, (1) what results could be obtained from the fattening of large-sized swine upon a ration of frozen wheat, and, (2) how frozen wheat compared with a mixture of equal parts by weight of pease, barley and wheat for increasing the live weight of the animals.

Twelve grade swine were purchased; their age and breeding were not known. The average weight at the commencement of the test was 186 lbs. each. They were sorted into three lots, which were nearly even as to weight, quality and appearance.

The frozen wheat was procured from the branch Experimental Farms at Brandon, Man., and Indian Head, N.W.T. It was graded "No. 2 frozen," "No. 3 frozen," and "unmarketable."

TABLE VI.

Pen 1 contained 4 swine. They were fed upon frozen wheat *ground* and soaked in cold water for 12 hours.

—	Dec. 28.	Jan. 25.	Feb. 22.	Mar. 14.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	739	847	969	1,100	.....
Increase in weight	.....	108	122	131	361
Feed consumed	.....	701	650	565	1,916
do per lb. of increase in live weight	.....	6·49	5.33	4·28	5.30

TABLE VII.

Pen 2 contained 4 swine. They were fed upon frozen wheat, *unground* and soaked for an average of 42 hours. (During the first 2 weeks of the test, the wheat was soaked for only 12 hours; that may account for the unusually large quantity consumed per lb. of increase in weight).

—	Dec. 28.	Jan. 25.	Feb. 22.	Mar. 14.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	745	784	958	1,091	.....
Increase in weight	.....	39	174	133	346
Feed consumed	.....	697	945	640	2,282
do per lb. increase in live weight	.....	17·87	5·42	4·81	6·59

TABLE VIII.

Pen 3 contained 4 swine. They were fed upon a mixture of equal parts by weight of wheat, barley and pease, *unground* and soaked for an average ef 42 hours.

—	Dec. 28.	Jan. 25.	Feb. 22.	Mar. 14.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	747	816	963	1,114	.....
Increase in weight	.....	69	147	151	367
Feed consumed	.....	673	935	620	2,228
do per lb. of increase in live weight	.....	9·75	6·36	4·10	6·07

Conclusions. From these tests with heavy swine, it appears that:—

(1.) when the frozen wheat was fed, *ground* and soaked for 12 hours, 11·3 lbs. of increase in the live weight were obtained per bushel of wheat;

(2.) When the frozen wheat was fed *unground* and soaked for 12 and 42 hours, 9·1 lbs. of increase in the live weight were obtained per bushel of wheat;

(3.) When the frozen wheat is to be fed *unground*, it should be soaked for at least 42 hours;

(4.) Leaving out of the reckoning, the weeks during which the frozen wheat *unground*, and the mixture of wheat, barley and pease *unground*, were soaked for only 12 hours, 5·24 lbs. of frozen wheat were consumed per lb increase, and 5·22 lbs. of the mixture of wheat, barley and pease were consumed per lb. of increase in the live weight.

The second test in this series was made with younger and smaller swine to discover, (1) the quantity of frozen wheat consumed per lb. of increase in live weight, and (2) the quantity of skim-milk which would be the equivalent of a pound of frozen wheat in increasing the live weight of the swine.

TABLE IX.

Pen V contained 5 swine bred at the Experimental Farm; they were out of a Poland-China sow by an Improved Large Yorkshire boar. They were fed upon frozen wheat *ground* and soaked for 12 hours. During the last 3 weeks of the test, they were fed upon the lowest quality of frozen wheat only, which has been graded "unmarketable."

—	Feb. 1.	Feb. 29.	Mar. 28.	May. 2.	May 30.	Totals.
	Lbs.	lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Live weight	306	470	595	724	827	.....
Increase in weight	.....	164	125	129	103	521
Feed consumed	.....	565	503	551	580	2,204
do per lb. of increase in live weight	.....	3·44	4·06	4·27	5·63	4·23

TABLE X.

Pen VI contained 4 swine bred at the Experimental Farm; they were out of a grade Berkshire sow by an Improved Large Yorkshire boar. They were fed upon an allowance of frozen wheat, *ground* and soaked for 12 hours, plus as much skim-milk as they would drink.

—		May 2.	May 31.	June 27.	Totals.
		Lbs.	Lbs.	Lbs.	Lbs.
Live weight		415	519	*577	.....
Increase in weight		.....	104	141	245
Feed consumed	Wheat	.....	327	322	649
	+ Milk	.....	1.601	1.465	3,066
do per lb. of increase in live weight	Wheat	.....	3·14	2·28	2·65
	+ Milk	.....	15 39	10·39	12·51

* 3 swine only.

Conclusions. From these tests with swine weighing an average of 61 lbs. each in the one pen, and an average of 104 lbs. each in the other pen, it appears that:—

(1.) When the frozen wheat was fed *ground* and soaked for 12 hours, 14·18 lbs. of increase in the live weight were obtained, per bushel of wheat;

(2.) In the feeding of swine from an average weight of 61 lbs. each, until they reached an average weight of 145 lbs. each, 15·46 lbs. of increase in the live weight were obtained, per bushel of wheat;

(3.) 1 lb. of frozen wheat was the equivalent of 7·91 lbs. of skim-milk in increasing the live weight;

(4.) The swine which were fed upon a ration containing skim-milk were lustier and more robust in appearance, than those which were fed upon grain only.

The swine from Pens V and VI were slaughtered; and the hams, sides and shoulders were cured in pickle by an Ottawa pork-dealer and ham-curer. The bacon and hams were pronounced excellent in quality, by many who examined them and afterwards purchased them for their own tables.

The parts of one side, from a pig of the lot which were fattened upon frozen wheat exclusively, were sent for opinion to Wm. Davies, Esq., of the Wm. Davies Co., Limited, Toronto, who have one of the largest and best known establishments for the curing of swine products in Canada. The following is the sum of the verdict of Mr. Davies upon its quality:—

"It is excellent, rather too salt, but very rich and luscious. I consider it superior to hogs fed on peas alone. The complaint regarding pea-fed bacon in England, is that the lean is hard, and this is the case to some extent with the fat also. It would be well if farmers in Canada would mix the grain and grind it, then give it to the hogs with whey, butter-milk or skim-milk."

GENERAL REMARKS.

In those parts of Canada, where a less or greater quantity of wheat may be injured by frost or other climatic conditions, the farmers should fortify their positions by providing means whereby to market, in the best way, this product which cannot be sold at paying prices in the form of grain. From 9·1 lbs. to 15·46 lbs. of increase in the live weight of swine have been obtained per bushel of frozen wheat consumed.

When swine are fetching 5 cents per lb. live weight, with an allowance of five per cent deducted for shrinkage, the frozen wheat fed under the least favourable of ordinary conditions, may realize 43¼ cents per bushel. At the same price for swine, the frozen wheat, fed under favourable conditions in the quality and age of the swine and the preparation of the feed, may realize 73·45 cents per bushel.

The conditions required for the profitable feeding of swine are (1) clean, dry, warm quarters, protected from wind and draughts, (2) as much wholesome feed—if grain preferably *ground* fine—as they will eat clean, three times a day, and (3) free access to a mixture of salt and ashes, to sods, or to soil.

To meet the requirements of foreign markets, swine with lean meat are wanted; larger numbers of them should be fed and fattened during the summer months; and they should be sold alive by the farmer or feeder in order that they may be slaughtered at packing houses, where the carcases can be cut and cured in a uniformly satisfactory manner, suited to the preferences of different buyers.

PART III.—EXPERIMENTAL DAIRY WORK.

In the Experimental Dairy, the experiments which have been carried on far enough to be reported upon are:—

I. Experiments in the creaming of milk during every month of the year (1) by a centrifugal cream separator; (2) by the gravity or setting method in the use of deep setting pails in ice water; and (3) by the gravity or setting method in the use of shallow milk-pans;

II. Experiments in the creaming of milk and the making of butter from the milk of cows (1) which had been milking for periods exceeding $6\frac{1}{2}$ months each, and (2) which had been milking for periods of less than $6\frac{1}{2}$ months each;

III. Experiments in churning sweet cream at different temperatures;

IV. Experiments in the churning of cream after the addition to it of different percentages of water.

I—*Experiments in the Creaming of Milk.*

A series of experiments was undertaken to obtain information upon the relative efficiency of three different methods of creaming milk, for every month of the year. The methods used were (1) an Alexandra centrifugal cream separator; (2) deep-setting shot-gun milk pails set in ice water, and (3) shallow milk-pans set on a table in a room of which the temperature was recorded. The milking cows in our herd comprised Shorthorns, Ayrshires, Holsteins, Jerseys, Devons, Quebec Jerseys, and Shorthorn grade cows. Fresh-calved cows came in from time to time during the year. Mixed milk from the herd was used in the tests; and the testing by each of the three methods lasted for a period of one week of every month.

The following Table shows the results which were obtained by the use of a No. 4 Alexandra cream separator, No. 8 size, during one week of every month.

TABLE I.

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature of milk.. Fahr.	98°	98°	98°	98°	95°	95°	98°	98°	98°	98°	98°	98°
Speed of separator.... per minute	7,000	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,200	7,500	7,500	7,200
Milk per hour..... lbs.	500	400	400	450	500	500	550	500	500	450	500	425
Fat in milk...per cent.	3·93	3·88	3·66	3·73	3·70	3·76	3·50	3·40	3·50	3·52	3·55	3·90
Fat in skim-milk..... per cent.	0·30	0·08	0·10	0·04	0·08	0·08	0·04	0·04	0·03	0·08	0·05	0·04
Fat in butter-milk .... per cent.	0·15	0.10	0·40	0·20	0·25	0·15	0·20	0·15	0·10	0·13	0·07	0·30
Milk per lb. of butter.. lbs.	23·89	22·78	24·45	23·44	23·31	23·09	25·48	25·46	25·46	24·94	24·40	22·06
Butter per 100 lbs. of milk .... lbs.	4·19	4·39	4·09	4·27	4·29	4·33	3·92	3·93	3·93	4·01	4·10	4·55
Butter per 100 lbs. of fat in milk..... .....lbs.	106·60	113·02	111·75	114·37	115·93	115·18	112·13	115·54	112·20	113·88	115·43	116·22
Fat in butter..per cent.	87·53	86·76	86·31	86·19	85·63	84.99	87·85	85·33	88·20	85·80	85·42	84·61
Fat not recovered..... per cent.	6·69	1·94	3·55	1·43	2·50	2·11	1.50	1.41	1·04	2·29	1·40	1·66

The following Table shows the results which were obtained by setting the milk during one week of every month in shot-gun milk-pails in a tank of ice water. The pails were of the ordinary cylindrical shape and size, viz., 20 ins. by $8\frac{1}{2}$ ins. The skimming was effected by the use of a cone-shaped skimmer; and enough of the skim milk was removed with the cream to ensure a complete recovery of the butter fat which had risen to the top. The milk in every case was set immediately after it was received from the stable and it was left for 22 hours in the ice water.

TABLE II.

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature of milk, when set.. .. Fahr.	88°	86°	89°	90°	93°	95°	95°	96°	84°	84°	82°	80°
Temperature of water.. Fahr.	38°	38°	38°	38°	38°	38°	38°	38°	36°	35°	36°	37°
Temperature of milk, when skimmed. Fahr.	38°	38°	38°	38°	38°	38°	38°	38°	36°	35°	36°	37°
Fat in milk...per cent.	3·95	3·81	3·68	3·72	3.70	3·76	3·50	3.40	3·50	3·52	3·55	3·90
Fat in skim-milk .... per cent.	0·92	0·69	0·51	0·41	0·35	0·45	0·23	0·23	0·35	0·39	0·80	0·87
Fat in butter-milk ... per cent.	0·20	0·35	0·39	0·20	0.20	0·15	0·20	0·30	0·20	0 30	0·20	0·25
Milk per lb. of butter. lbs.	26·51	25·98	26·17	25·77	24.85	25·30	26·49	26·41	25.77	25·94	28·46	25·64
Butter per 100 lbs. of milk.. ..... lbs.	3·77	3·85	3·82	3·88	4·02	3·95	3·77	3·79	3·88	3·85	3·51	3·90
Butter per 100 lbs. of fat in milk... . lbs.	95·48	101·01	103·83	104·35	108·75	105·11	107.84	111·39	110·86	109.57	99·03	100·00
Fat in butter..per cent.	84·42	83·27	83·90	86 41	84·14	85·42	87·01	83·73	82·28	81·99	82·35	81·79
Fat not recovered..... per cent.	19·39	15·88	12·34	9·76	8·49	10·22	6·16	6·74	8·79	10·16	18·44	18·20

The following Table shows the results which were obtained by setting the milk, during one week of every month, in shallow milk-pans. The pans were twelve inches in diameter and the milk was set in them to a depth of three inches. In every case, the milk was set immediately after it was received from the stable; and it was left for 22 hours before it was skimmed.

TABLE III.

—	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature of milk, when set.....Fahr.	88°	86°	89°	90°	93°	95°	95°	96°	84°	84°	82°	80°
Temperature of room.. Fahr.	60°	60°	58°	55°	60°	70°	72°	65°	45°	45°	48°	50°
Temperature of milk, when skimmed. Fahr.	60°	60°	60°	56°	60°	70°	73°	66°	45°	45°	48°	50°
Fat in milk...per cent.	3·98	3·81	3·68	3·72	3·70	3·76	3·50	3·40	3·50	3·52	3·55	3·90
Fat in skim-milk .... per cent.	0·72	0·53	0·40	0·58	0·48	0·41	0·32	0·40	0·45	0·47	0·50	0·55
Fat in butter-milk .... per cent.	0·30	0·35	0·35	0·20	0·15	0·15	0·20	0·15	0·20	0·30	0·15	0·20
Milk per lb. of butter.. lbs.	25·00	25·05	25·00	27·05	25·46	25·00	25·69	26·53	27·38	27·16	26·92	24·39
Butter per 100 lbs. of milk..... lbs.	4·00	3·99	4·00	3·70	3·93	4·00	3·89	3·77	3·65	3·68	3·71	4·1
Butter per 100 lbs. of fat in milk ..... lbs.	100·50	104·76	108·70	99·35	106·17	106·40	111·28	110·86	104·36	104·71	104·67	105·13
Fat in butter..per cent.	83·75	83·30	82·50	86 82	83·50	84·82	82·31	80·76	85·24	84·04	84·15	83·61
Fat not recovered..... per cent.	15·70	12·73	10·33	13·74	11·35	9·74	8·41	10·46	11·04	12·00	11·92	12·10

The percentages of butter-fat in the mixed herd milk were practically the same for the three several weeks of every month; the greatest difference being in January, when it was ·05 of one per cent of fat.

The following charts have been prepared to show at a glance, the comparative results which were obtained from the three different methods.

CHART I.

NUMBER of pounds of Butter obtained per 100 pounds of Milk, from the three different methods of creaming, as per Tables I., II. and III.

Centrifugal cream separator, ——————
Deep-setting milk-pails, ——————
Shallow milk-pans, ...

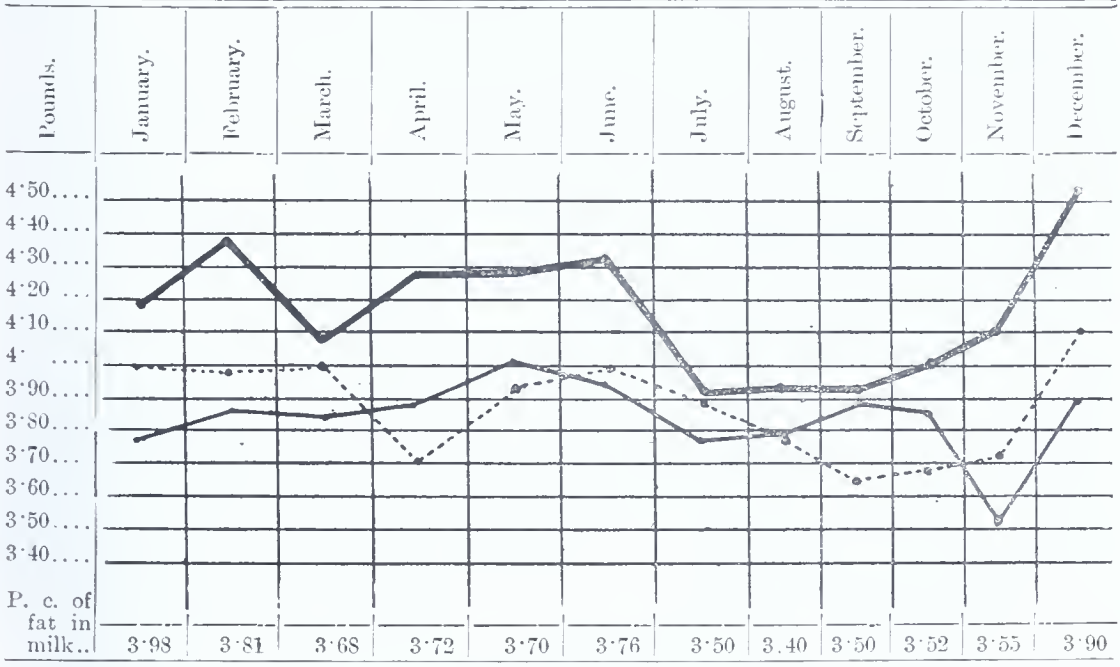


CHART II.

PERCENTAGE of Fat in Skim-milk, from the three different methods of creaming, as per Tables I., II. and III.

Centrifugal cream separator, ——————
Deep-setting milk-pails, ——————
Shallow milk-pans, ...

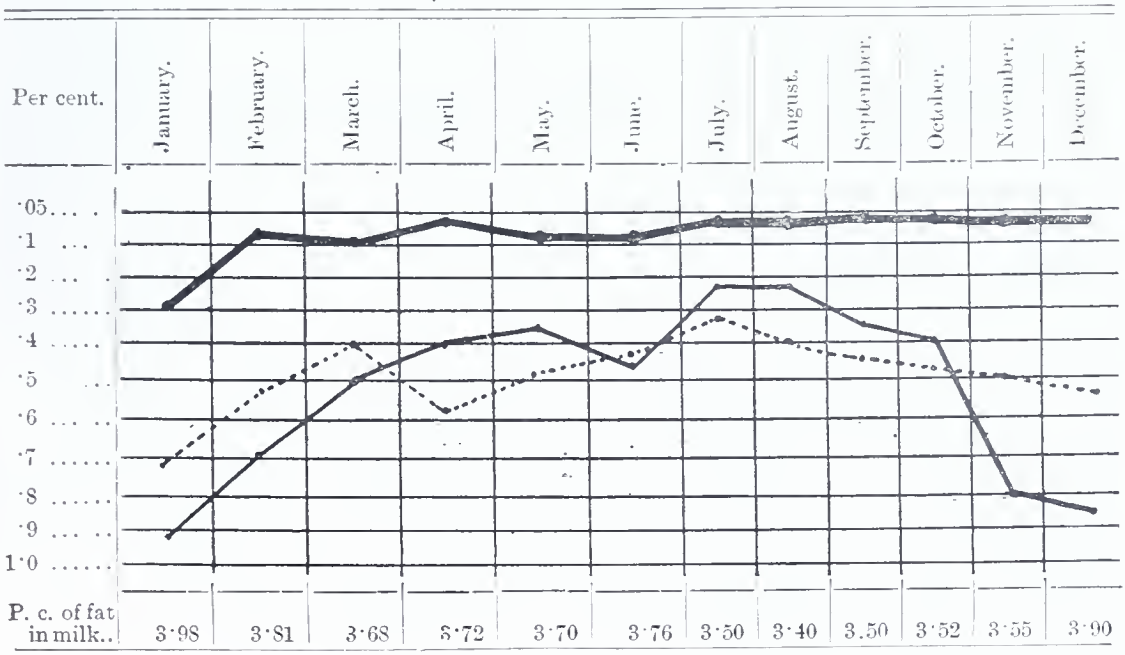
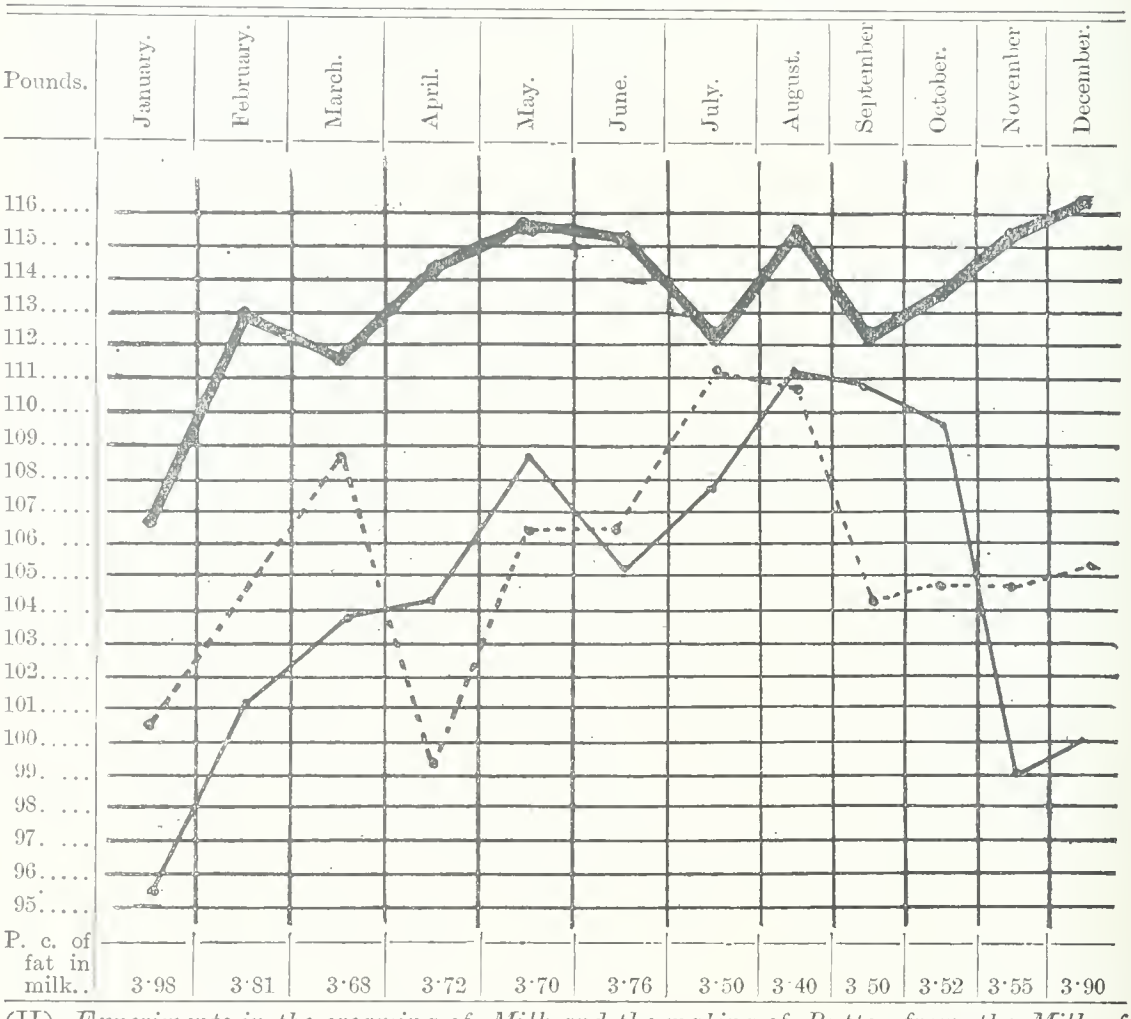


Chart III.

Number of pounds of marketable Butter, obtained per 100 pounds of Butter fat in milk, from the three different methods of creaming, as per Tables I., II. and III.

Centrifugal cream separator, ——————
Deep-setting milk-pails, — — — —
Shallow milk-pans, ...



(II) *Experiments in the creaming of Milk and the making of Butter from the Milk of Cows,* (1) *which had been milking for periods exceeding* $6\frac{1}{2}$ *months each, and* (2) *which had been milking for periods of less than* $6\frac{1}{2}$ *months each.*

The following Table shows the results on the average, from 4 tests in each case, when the creaming was effected by the centrifugal cream separator.

Table IV.

—	From Cows milking more than $6\frac{1}{2}$ months each.	From Cows milking less than $6\frac{1}{2}$ months each.
Temperature of milk,.....Fahr.	98°	98°
Speed of separator .....per min.	7,400	7,400
Milk per hour..... lbs.	450	500
Fat in milk .....per cent.	3·68	3·18
Fat in skim-milk..... "	·20	·02
Fat in butter-milk ..... "	·05	·06
Butter per 100 lbs. of fat in milk..... lbs.	115·06	120·48
Fat not recovered.....per cent.	4·23	·72
Butter score for flavour out of possible 40 points.... at 1 week	37	39
Butter score for flavour out of possible 40 points.... at 14 weeks	28	35

Conclusions. The results from these 4 tests indicate that:—

(1.) From the milk of cows, which had been milking for periods exceeding $6\frac{1}{2}$ months each, 3·51 per cent more of the butter-fat was not recovered, even when the rate of inflow of the milk into the centrifugal cream separator was 10 per cent less than in the case of the milk from cows which had been milking for periods of less than $6\frac{1}{2}$ months each;

(2.) The butter from the milk of the cows which had been milking for the longer periods, was not as good in the flavour and did not keep so well as the butter from the milk of the cows which had been milking for the shorter periods.

The following Table shows the results, on the average from 7 tests in each case, when the creaming was effected by the deep-setting milk-pails, set in ice water for a period of 22 hours.

TABLE V.

—		From Cows milking more than $6\frac{1}{2}$ months each.	From Cows milking less than $6\frac{1}{2}$ months each.
Temperature of milk when set	Fahr.	85°	86°
Temperature of water	"	38°	38°
Temperature of milk when skimmed	"	38°	38°
Fat in milk	per cent.	3·67	3·56
Fat in skim-milk	"	1·43	·21
Fat in butter-milk	"	·40	·35
Butter per 100 lbs of fat in milk	lbs.	80·91	114·85
Fat not recovered	per cent.	32·55	6·34
Butter score for flavour out of possible 40 points	at 4 weeks	33	35

Conclusions. The results from these tests indicate that:—

(1.) From the milk of cows which had been milking for periods exceeding $6\frac{1}{2}$ months each, 26·21 per cent more of the butter-fat was not recovered, than from the milk of cows which had been milking for periods of less than $6\frac{1}{2}$ months each;

(2.) The butter from the cows which had been milking for the longer periods was not as good in the flavour as the butter from the milk of the cows which had been milking for the shorter periods.

The following Table shows the results, on the average from 8 tests in each case, when the milk of one fresh-calved cow was mixed with the milk of the cows which had been milking for periods exceeding $6\frac{1}{2}$ months each, and when the creaming was effected by the deep-setting milk-pails, set in ice water for a period of 22 hours.

TABLE VI.

—		From Cows milking more than $6\frac{1}{2}$ months each	From Cows milking less than $6\frac{1}{2}$ months each
Temperature of milk when set	Fahr.	85°	85°
Temperature of water	"	38°	38°
Temperature of milk when skimmed	"	38°	38°
Fat in milk	per cent.	3·58	3·54
Fat in skim-milk	"	·55	·23
Fat in butter-milk	"	·40	·32
Butter per 100 lbs. of fat in milk	lbs.	103·29	114·94
Fat not recovered	per cent.	14·00	6·71
Butter score of flavour out of possible 40 points	at 5 weeks.	36	38

Conclusions. The results from these 8 tests indicate that:—

(1.) When the milk of one fresh-calved cow was added to the milk from eight cows, which had been milking for periods sxeeeding $6\frac{1}{2}$ months each, 7·29 per cent more of the butter-fat was not recovered, than from the milk of cows which had been milking for periods of less than $6\frac{1}{2}$ months each;

(2.) The addition of the milk of one fresh-calved cow to the milk from eight cows which had been milking for periods exceeding $6\frac{1}{2}$ months each, resulted in the recovery of 18·55 per cent more of the butter-fat, than from the milk of the same cows when set in deep-setting milk-pails, without the addition of the milk from a fresh-calved cow.

(III.) *Experiments in churning Sweet Cream at different Temperatures.*

During the month of March a number of tests were conducted to ascertain the temperature at which the churning of sweet cream would give the most efficient recovery of the butter-fat. In a No. 5 Daisy revolving barrel churn, of a capacity of fourteen gallons, 16 tests were made as shown in Table VII.

TABLE VII.

Number of Tests made.	2	6	6	1	1
Quantity of cream.....lbs.	42	36	38·5	40	23
Temperature when churning was started.....Fahr.	41°	46°	45°	48°	55°
do do finished..... "	58°	58°	59°·5	58°	58°
Increase in temperature ..... "	17°	12°	14°·5	10°	3°
Period of churning.....min.	90	75	85	40	10
Speed of churn.....rev. per min.	70	70	68	72	74
Fat in butter-milk.....per cent.	0·10	0·20	0·25	0·25	0·60

In a No. 2 Daisy revolving barrel churn of a capacity of three gallons, 26 tests were made as shown in Table VIII.

TABLE VIII.

Number of Tests made.	9	12	2	1	1	1
Quantity of cream .....lbs.	20	12	25·5	19	30	15
Temperature when churning was started.....Fahr.	42°	44°	50°	52°	57°	58°
do do finished ..... "	60°	57°	59°	58°	61°	62°
Increase in temperature. ..... "	18°	13°	9°	6°	4°	4°
Period of churning .....min.	113	95	90	50	70	50
Speed of churn..... rev. per min.	68	68	71	65	68	70
Fat in butter-milk..... per cent.	0·15	0.20	0·15	0·30	0·50	0·40

Conclusions. The results from these 42 tests indicate that:—

(1.) When the churning of sweet cream is started at a temperature of 50° Fahr., or under, the quantity of butter-fat remaining in the butter-milk need not exceed 0·25 of 1 per cent;

(2.) For the efficient recovery of the butter-fat by the churning of sweet cream, the temperature of the cream should not be above 50° Fahr., when the churning is started; and the churn (if a revolving one) should not be filled to more than one quarter of its actual holding capacity.

(IV.) *Experiments in the churning of Cream after the addition to it of different percentages of Water.*

Four series of tests were made to compare the results from the churning of cream with and without the addition of different percentages of water to the cream, before it was ripened. These tests were conducted at intervals from May 6th to October 1st. The cream was obtained from mixed herd milk (containing on the average 3·45 per cent of butter-fat) by means of a centrifugal cream separator, which separated 14 per cent of the whole milk as cream. The cream, in each test of the four series, was divided into two equal portions. The one portion was ripened to the usual degree of sourness or was kept sweet, and was churned as normal cream; a percentage of water (from 10 to 30 per cent) was added to the other portion in each test, after which it was churned in the same manner as the normal cream.

The following Table shows the results which were obtained, on the average, from the tests of the different series.

TABLE IX.

Number of tests made.	Series 1. 5		Series 2. 4		Series 3. 4		Series 4. 5	
	Normal Cream.	10 per cent of water added.	Normal Cream.	20 per cent of water added.	Normal Cream.	25 per cent of water added.	Normal Cream.	30 per cent of water added.
Milk per lb. of butter..... lbs.	25·77	26·11	24·83	25·20	25·17	25·45	25·14	25·74
Butter per 100 lbs. of milk. "	3·88	3·83	4·03	3·97	3·97	3·93	3·98	3·88
Butter per 100 lbs. of fat in milk..... .... "	115·23	113·76	116·58	114·84	113·50	112·27	115·03	112·34
Fat not recovered..... per cent.	2·32	2·37	1·83	1·83	2·41	2·61	3·20	3·12

The following Table shows the results, on the average from the 18 tests, with normal cream and the results, on the average from the 18 tests, with cream to which water had been added—(from 10 to 30 per cent as per Table IX).

TABLE X.

	Normal Cream.	Watered Cream.
Milk per lb. of butter..... lbs.	25·22	25·62
Butter per 100 lbs. of milk..... "	3·96	3·90
Butter per 100 lbs. of fat in milk..... "	115·08	113·30
Fat not recovered..... per cent.	2·44	2·48

An examination was made of the quality of the butter obtained. The butter from the watered cream was not so solid or firm in the grain as the butter from the normal cream; there was no appreciable difference in the flavour.

The churning period in every case was longer with the watered cream than with the normal cream. The additional time which was required for churning the watered cream bore no definite ratio to the percentage of water which had been added to the cream. The extra time was from 1 minute to 30 minutes.

Conclusions. When water was added to the cream in these 18 tests from May to October, the results indicate that:—

(1.) The churning was slightly less efficient in the recovery of the butter fat;

(2.) The quantity of marketable butter obtained per 100 lbs. of milk was slightly less (·06 lb.);
(3.) The butter was not so firm or solid in the grain;
(4.) The churning period, at an equal temperature, was longer by from 1 minute to 30 minutes.

PART IV.—FORTY-ACRE LOT.

In the spring of 1891, a portion of the farm, measuring about forty acres, was set apart for the particular purpose of growing forage crops for cattle, in order to ascertain and illustrate how many cattle might be fed for the whole year upon the products of that area. It was not intended to adopt a method of cultivation which would require the employment of hand labour to any unusual extent. The main object was to direct the attention of farmers to the easy practicability of keeping cattle in larger numbers, than has been their custom, on the moderate and small sized farms of Canada.

The soil in that part of the farm devoted to this experiment is of a clay and sand loam; about five acres of it are of a light sandy loam; and about three acres of it are of a peaty loam. A dressing of barnyard manure was given to twenty-nine acres of the area in the spring of 1891, at the rate of from 18 to 20 tons per acre.

It was mentioned in my report of last year that the yield of crops in 1891, did not come up to our expectations. A hailstorm on 13th of August, 1891, injured the crops on it, and was estimated to have lessened the returns and the feeding value of them by 25 per cent. The following is a summary of the crops harvested in 1891:—

TOTAL YIELD OF CROPS FROM 40-ACRE LOT IN 1891.

Ripened Crops.

		Lbs. of Straw.	Lbs. of Grain.
8 acres,	Mixed Cereal crop	26,454	13,245
3 acres	Golden Vine Pease		905
	Goose Wheat	1,003	437
	Beardless Barley	3,102	1,373
	Banner Oats	2,790	2,060
3 acres,	Mixed Cereal crop	10,442	4,345
14	Totals	43,791	22,365

Root Crops.

		Lbs.
1 acre,	Carrots	26,785
1 acre,	Mangels and Turnips — Mangels	8,110
	Mangels and Turnips — Turnips	9,655
1 acre,	Turnips	29,584
3	Total	74,134
½ acre,	Cabbage and Kohl Rabi	15,296

Cured Fodder Crops.

	Lbs.
2 acres, Spring Rye	14,080
Mixed Cereal crop (second cutting)	1,825
1 acre, Indian Corn, stooked and cured	11,940
11½ acres, Indian Corn, put into silos.....130 tons+	1,750
14½	

1½ acres, Indian Corn, fed green to cattle from 7th of August.
3⅔ acres, Mixed Cereal crop, fed green to cattle.
4⅓ acres, pastured.

The total cost for labour in the growing of these crops of 1891, and in the delivering of them at the barn, silos or stable, threshed or cut and ready to feed, was as follows;—

Hauling and spreading of manure	$109 62
Ploughing, harrowing, sowing and planting	114 00
Hand cultivating and weeding	85 62
Cultivating by horse	23 65
Reaping, teaming, threshing, cutting, grinding, &c	223 70
Other labour	9 15
	$565 74
Permanent improvements, draining and fencing	33 50

The time of a team and man was charged at the rate $2.50 per day and the time of a man at $1.25 per day.

TOTAL YIELD OF CROPS FROM 40-ACRE LOT IN 1892.

Cereal Crops.

	Lbs. of Straw.	Lbs. of Grain.
8·75 acres, Mixed Cereal crop, as in Table I	25,039	13,317

	Lbs., cured Fodder.
5 acres, Mixed Cereal crop, as in Table II	32,605

	Lbs. green Fodder.
1·75 acres, Mixed Cereal crop (fed green)	22,801
3·25 acres, Fall Rye	26,155
1·9 acres, Spring Rye	15,910
second cutting of do. (partly cured)	4,040

Root Crops.

	Lbs.
2 acres, Carrots, as per Table III	51,015
2 acres, Mangels do	57,128
1 acre, Greystone Turnips (catch crop after crop of mixed cereals)	20,305

Indian Corn Crops.

	Tons.	Lbs.
9 acres, Indian Corn, as per notes, plots Nos. 1 to 6....	156	352
3 acres, Indian Corn, do do 7 to 9....	39	1065
3 acres, Indian Corn, do do 10.....	38	860
·46 acre, Indian Corn and Sunflowers.....	4	1720
·46 acre, Sunflower heads.	3	710
·41 + acre, Horse Beans.....	2	1760
2·43 acres, pastured.....		

NOTES ON THE CEREAL CROPS.

8 *acres of Mixed Cereal Crops.*—The soil on which these were grown was a sandy loam, rather uneven in character; part of it was of a peaty nature with interruptions of clay and sandy soil of a whitish colour. Most of the land had formed part of a wet swamp five years before; and portions of the surface soil had been burned during the clearing of it. In the spring of 1891 it received a dressing of barn yard manure at the rate of about 18 tons per acre. A crop of fodder corn was taken off 7 acres of it during that season; the other acre was cropped in 1891 with mixed cereals.

A different mixture, of *Campbell's White Chaff Wheat, Peerless White Barley, Banner Oats* and *Golden Vine Pease*, was sown on each plot. By reason of the uneven character of the soil, the yields per acre from the different mixtures did not give results which can be relied upon as evidence of the best combinations of these grains for fodder crops.

TABLE I.

Number of Plot.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
Mixture sown—								
Wheat.....Bush.	½	1	1	.....	1	1½	.....	.....
Barley..... do	¾	1	.....	1	1	.....	1½	.....
Oats..... do	1	.....	1	1	1	.....	.....	1½
Pease..... do	¾	1	1	1	.....	1½	1½	1½
Flax..... Lbs.	3	3	3	3	3	3	3	3
Total, Bush. and Lbs....	3 3	3 3	3 3	3 3	3 3	3 3	3 3	3 3
Yield of straw and grain ....Lbs.	4,742	4,002	4,632	4,222	4,312	4,342	3,542	4,572
Grain from thresher..... do	1,598	1,361	1,516	1,522	1,337	1,490	1,479	1,600

These mixtures were all sown on May 4, and came up from May 14 to 15. They were ripe from August 13 to 17 and were cut between August 15 and 17. The different grains ripened together, with the exception of the oats, which ripened one or two days before the other sorts. The one mixture which did not contain pease (plot No. 5) gave the smallest yield of grain per acre.

The ¾ acre of Mixed Cereal crop was grown on an odd strip of land, which had been manured in the spring of 1891. A crop of Indian corn was taken off, and it received a light dressing of barnyard manure in the spring of 1892. The mixture sown was *White Connell Wheat, Oderbruch Oats* and *Mummy Pease*, at the rate of one bushel of each per acre. It was sown on May 4, and it came up and was cut at the same dates as plots Nos. 1 to 8. The total yield was,—straw and grain, 3,990 lbs.; grain from the thresher, 1,414 lbs.

5 *acres of Mixed Cereal crop.*—Five plots of one acre each were sown with different mixtures of *Goose Wheat, Kinver Barley, Banner Oats, Multiplier Pease* and 3 lbs. of Flax per acre. The soil of plots Nos. 1 and 2 was a mellow loose sandy loam. It had been cropped in 1891 by rye, which was cut green, followed during the same season by Hungarian grass. A dressing of manure at the rate of 10 or 12 tons per

acre was applied in the spring of 1892. Plots Nos. 3, 4 and 5 were on land which had been manured in 1891 and had been cropped during that season with roots. No manure was applied to them in 1892.

TABLE II.

Number of Plot.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Mixture sown—					
Wheat.....Bush.	$\frac{1}{2}$	1	1		1
Barley..... do	$\frac{3}{4}$	1	.....	1	1
Oats..... do	1	.....	1	1	1
Pease..... do	$\frac{3}{4}$	1	1	1	.....
Flax.....Lbs.	3	3	3	3	3
Total.....Bush. and Lbs.	3 3	3 3	3 3	3 3	3 3
Yield of cured fodder.....Lbs.	7,991	5,556	5,376	6,606	7,076

These mixtures were all sown on April 30, and came up May 13 and 14. They were cut for cured fodder on August 6 and 8. On account of the wet weather which prevailed, the crops from the different plots did not reach a uniform state of dryness; the weight which is recorded for plot No. 1 was obtained from weighing part of the crop when it was comparatively wet.

1·75 *acres Mixed Cereal crop.*—The soil was clay loam; it received a light dressing of manure in the spring of 1892 at the rate of about 10 tons per acre. The crop was cut and fed green to the cattle from day to day. The total yield of green fodder was 22,801 lbs.

COST OF LABOUR FOR GROWING MIXED CEREAL CROPS.

The following statement of the cost of labour for growing $13\frac{3}{4}$ acres of mixed cereal crops, may afford useful information for the making of comparisons between the cost of this and other kinds of fodder.

Rent of land, at $3 per acre	$ 41 25
Ploughing, at $2 per acre	27 50
Harrowing twice, rolling once at 20 cents per acre each.	8 25
Seed, 3 bushels per acre	24 75
Sowing $1\frac{6}{10}$ days at $2.50 per day	4 00
Cutting with mower, $3\frac{8}{10}$ days, at $2.50 per day	9 50
Labour, turning and cocking, 9 days at $1.25 per day	11 25
Drawing in, 3 days at $2.50 per day	7 50
Labour, loading and unloading, 11 days at $1.25 per day.	13 75
Horse-rake and horse-fork, $1\frac{4}{10}$ days at $1.50	2 10
Threshing ($8\frac{3}{4}$ acres), 10 days at $1.25 per day	12 50
Man at engine	1 50
Proportion of time of farm foreman	27 50
	$ 191 35

These figures do not include any allowance for the use of farm machinery, nor do they include any amount as an equivalent for the exhaustion of the soil. The cost for labour, without threshing, is $12.90 per acre. The average yield of the cured fodder crops from 5 acres was 3 tons 521 lbs. per acre, which gives an average cost of $3.95 per ton for labour of growing, including cost of seed and rent of land.

CROPS OF RYE FOR FODDER.

3·25 *acres of Fall Rye.*—Fall rye of the variety *Reading Giant* was sown in September, 1891, on light sandy loam. It followed a crop of fodder corn which had been taken off in 1891. Part of the rye crop was fed green, the remainder of it was

cut on 15th June and put into a silo. It was run through a straw cutter. The total yield was 13 tons 155 lbs.

1·9 *acres of Spring Rye.*—This was sown on a light clay loam soil, lying adjacent to the pasture plot, for the purpose of seeding it down. It yielded 7 tons 1,910 lbs.

Cost of labour for growing crop of Rye for fodder.

The following is a statement of the cost of labour for growing 5·15 acres of rye and putting the crop in the stable and the silo.

Rent of land, at $3 per acre	$ 15 45
Ploughing, at $2 per acre	10 30
Harrowing twice, rolling once, at 20 cents per acre each	3 09
Seed, 7½ bushels at $1 per bushel	7 50
Sowing $\frac{5}{10}$ day at $2.50 per day	1 25
Cutting with binder and mower, $1\frac{2}{10}$ days at $2.50 per day	3 00
Drawing in, 1 day at $2.50	2 50
Labour, loading and cutting, 5 days at $1.25 per day	6 25
Man at engine	1 50
Binding twine, 16 lbs. at 11 cents per lb	1 76
Stablemen's time, taking in the part fed green	2 25
Proportion of time of farm foreman	10 30
	$ 65 15

These figures do not include any allowance for the use of farm machinery, nor do they include any amount as an equivalent for the exhaustion of soil. The cost for labour was $12.65 per acre. The average yield of the rye fodder, weighed green, was 4 tons 64 lbs. per acre, which gives an average cost of $3.13 per ton, for labour of growing, including cost of seed and rent of land.

Root Crops.

4 *acres of Root Crops.*—The soil was a sandy loam with a distinctly peaty character. It received a dressing of barnyard manure at the rate of about 18 tons per acre in the spring of 1891. In that season a crop of mixed cereals was taken off. No manure was applied in 1892. Carrots and mangels were put in rows 2 feet 3 inches apart. They were sown from May 10 to 13. The mangels came up from May 23 to 24; and the carrots came up from May 24 to 30. All of the 8 plots of ½ acre each were cultivated with a small hand cultivator on June 4, and with a horse cultivator on June 7 and June 23. They were thinned from June 28 to July 5. They were pulled October 22. The yields are given in the following Table.

Table III.

Plot No.	Varieties of Carrots.	Yields per ½ Acre.
1	Steele's Improved Short White	7 tons 260 lbs.
2	Rennie's New Mammoth Intermediate	7 " 1,330 "
3	Pearce's Orange Giant	5 " 285 "
4	Steele's Guerande or Ox Heart	5 " 1,140 "
	Varieties of Mangels.	
5	Rennie's Selected Mammoth Long Red	8 " 525 "
6	Pearce's Canadian Giant	8 " 750 "
7	Steele's New Giant Yellow Intermediate	5 " 1,816 "
8	Rennie's Giant Yellow Globe	6 " 37 "
	Total from 4 acres	54 tons 143 lbs.

Cost of Labour for Growing Roots.

The following is a statement of the cost of labour for growing 4 acres of roots (carrots and mangels) and putting the crop in the root-house.

Rent of land, at $3 per acre	$ 12 00
Ploughing, at $2 per acre	8 00
Harrowing twice, rolling once, at 20 cts. per acre each	2 40
Seed, carrots, 10 lbs., at 50 cts. per lb.	5 00
Seed, mangels, 10 lbs., at 20 cts. per lb.	2 00
Sowing, $1\frac{5}{10}$ days, at $1.25 per day	1 88
Cultivating by hand, 3 days, at $1.25 per day	3 75
Cultivating with single horse, $5\frac{7}{10}$ days, at $1.50 per day	8 55
Labour, thinning, $11\frac{5}{10}$ days, at $1.25 per day	14 38
Labour, hoeing, 21 days, at $1.25 per day	26 25
Labour, pulling, 25 days, at $1.25 per day	31 25
Drawing in, $3\frac{2}{10}$ days, at $2.50 per day	8 09
Proportion of time of farm foreman	12 00
Total	$135 46

These figures do not include any allowance for the use of farm machinery, nor do they include any amount as an equivalent for the exhaustion of soil. The cost for labour was $33.86 per acre. The average yield of the roots was 13 tons 1,035 lbs. per acre, which gives an average cost of $2.50 per ton, for labour of growing, including cost of seed and rent of land.

Indian Corn Crops.

9 *acres of Indian Corn.*—The soil for the six plots of corn in this division, was a clay loam which had been cropped with mixed cereals in 1891. It had not been manured for at least six years. In the spring of 1892, it received a dressing of barnyard manure at the rate of about ten tons per acre.

Plot No. 1 contained 2 acres. It was planted by the use of a hand corn planter on 18th of May, with *Thoroughbred White Flint* corn, in hills 3 feet apart both ways, with from 4 to 5 grains per hill. Some of it came up 1st and 2nd of June, but more than one-half of the kernels rotted in the ground, apparently by reason of the cold and wet weather which prevailed. It was harrowed on the 4th of June, and the blank hills were replanted on 10th June.

On 29th June, two or three grains of *Asparagus Pole Beans* were dibbled in beside every hill of corn in two rows; the next two rows of corn were left without beans; beans were planted at every hill in the next two rows, and in every alternate two rows across the whole plot. The beans came up 9th and 10th July. They gave a rather spindling growth of vines and bore fairly long pods which were filled but not ripened.

The ears on the corn reached the early milk stage; but on the whole, the crop was not sufficiently advanced in growth to make the best quality of ensilage. The leaves were dried and withered to a considerable extent as the result of frost on 9th September. It was cut 26th to 27th September. The total yield from the two acres was 43 tons 1,830 lbs., weighed without being wilted.

Plot No. 2 contained 2 acres. It was planted with *Longfellow* corn, at the same time and in the same way as plot No. 1. It came up on the 2nd of June and was harrowed 4th of June.

On the 29th of June, *Butter Pole Beans* were planted at every hill in every two alternate rows as in plot No. 1. These beans rotted in the ground at nine hills out

of ten. The few which grew were not vigorous, and did not have any appreciable value in the crop.

The corn reached the glazing stage of growth, before it was caught by a frost on the 9th of September, which caused the leaves to become dry and withered. The total yield from the 2 acres was 36 tons 733 lbs., weighed without being wilted.

Plot No. 3, contained 2 acres. It was planted with *Pearce's Prolific* corn, at the same time and in the same way as plots Nos. 1 and 2. It came up on 2nd of June and was harrowed on the 4th of June.

On 29th of June, *Dutch Case Knife Pole Beans* were planted at every hill on every two alternate rows, as in plots Nos. 1 and 2. These beans came up 9th and 10th July, and reached the stage of growth when the pods were fit for cooking as a table vegetable.

The corn reached the glazing stage of growth. The leaves were dried and withered in consequence of frost before it was cut. The total yield from the 2 acres was 29 tons 539 lbs., weighed without being wilted.

Plot No. 4 contained 1 acre. It was planted on May 25th with *Pearce's Prolific* corn in hills 3 feet apart both ways, with from 4 to 5 grains per hill. It came up June 3 and was harrowed June 4. Part of this plot was cut green from August 31 for feeding the cattle daily. When the remainder of it was cut for the silo on September 13 it had reached the glazing stage of growth. The total yield from the one acre was 16 tons 950 lbs., weighed without being wilted.

Plot No. 5 contained 1 acre. It was planted with *Longfellow* corn, at the same time and in the same way as plot No. 4. It also came up and was harrowed at the same time. The crop on this plot was cut from August 12, and was fed to the cattle daily until August 31. The total yield from the one acre was 15 tons 1,045 lbs.

Plot No. 6 contained 1 acre. It was planted with *Thoroughbred White Flint* corn, at the same time and in the same way as plots Nos. 4 and 5. It also came up and was harrowed at the same time. The crop on this plot reached the early milk stage of growth, and was not near enough to maturity to yield the best quality of ensilage. The total yield from the one acre was 20 tons 1,125 lbs., weighed without being wilted.

3 *acres of Indian Corn.*—The soil was a sandy loam, which had received a dressing of barnyard manure in 1891, had been cropped by Indian corn, and had received a dressing of barnyard manure in the spring of 1892 at the rate of about 10 tons per acre.

Plot No. 7 contained 1 acre. It was planted on May 25, with *Longfellow* corn, in hills 3 feet apart both ways, with from 4 to 5 grains per hill. It was harrowed on June 2 and came up June 3. It had reached the glazing stage of growth before it was caught by a frost on September 9, which caused the leaves to become dry and withered. It was cut and put in a silo on September 21 and 22. The total yield from the acre was 10 tons 1,895 lbs., weighed without being wilted.

Plot No. 8 contained 1 acre. It was planted at the same time as plot No. 7, with *Longfellow* corn; but in this case the corn was grown in rows 3 feet apart, with from 3 to 4 grains per lineal foot in the rows. The total yield from the acre was 11 tons 1,525 lbs., weighed without being wilted.

Plot No. 9 contained 1 acre. It was planted on May 26 with a mixture of equal parts of *Longfellow* corn and *Horse Beans*, in rows 3 feet apart, at the rate of 24 lbs. of the mixture per acre. The beans grew in the rows with the corn to a height of from 3 feet to 3½ feet, and carried pods which in a few instances contained ripened beans. The bean stalks in most cases were green and succulent when the crop was cut. The corn had reached the glazing stage of growth. The whole crop was put into a silo on September 21. The total yield from the acre was 16 tons 1,645 lbs., weighed without being wilted.

3 *acres of Indian Corn and Horse Beans.*—The soil of this plot was a mellow sandy loam. A crop of fall rye had been grown upon it, and had been cut on 15th June. A dressing of barnyard manure at the rate of 8 to 10 tons per acre was applied. On 18th June it was planted with a mixture of *Smut Nose Flint* corn and horse beans, in rows 3 feet apart, at the rate of 12 lbs. of each per acre. The corn was entirely eaten off by crows. It was replanted on 29th June, and suffered a like fate from the crows, in spite of scarecrows and corn soaked in a mixture of Paris green, &c. It was planted the third time on 6th July, with the mixture of *Smut Nose Flint* corn and *Horse Beans*. It came up 12th July. The corn attained a height of about 6 feet and reached the stage of growth when ears were beginning to appear. The bean stalks were from 3 feet to 3½ feet in height, but pods were not formed on them. On 15th September the crop was cut and put into a silo without being wilted. The leaves of the corn were dry and withered from a frost which came on 9th September. The total yield from the 3 acres was 38 tons 860 lbs.

Cost of Labour for growing Indian Corn for Fodder.

The following is a statement of the cost of labour for growing 15 acres of Indian corn and putting the crop into silos or the stable for feeding cattle.

Rent of land, at $3 per acre	$ 45 00
Ploughing, at $2 per acre	30 00
Harrowing 3 and 4 times, 20 cents per acre per time	10 80
Marking hills, $1\frac{2}{10}$ days, at $1.50 per day	1 80
Marking hills, 1 day at $1.25 per day	1 25
Seed	7 50
Sowing, 1 day at $2.50	2 50
Planting by hand, 7 days at $1.25 per day	8 75
Cultivating with single horse, $3\frac{6}{10}$ days, at $1.50 per day	5 40
Cultivating with team, $7\frac{2}{10}$ days, at $2.50 per day	18 00
Hoeing, 16 days at $1.25 per day	20 00
Cutting in field and at silo, 67 days at $1.25 per day	83 75
Drawing in, 13 days at $2.50 per day	32 50
Man at engine, 7 days at $1.50 per day	10 50
Use of engine and fuel, 6½ days at $5 per day	32 50
Proportion of time of farm foreman	30 00
	$340 25

These figures do not include any allowance for the use of farm machinery (except the engine), nor do they include any amount as an equivalent for the exhaustion of soil. The cost for labour was $22.68 per acre. The average yield of the corn was 15 tons, 1,218 lbs. per acre, which gives an average cost of $1.45 per ton, for labour of growing, including cost of seed and rent of land.

REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith a report of some of the work carried on in the Horticultural Department during the year 1892.

As a fruit year, 1892 has been totally different from 1891. The heavy precipitation during May and June, was very favourable to transplanting and nursery operations, but at the same time offered the best possible conditions for the development of injurious fungi. There is little doubt, too, that the excessive rainfall during the blossoming period of fruit trees prevented to some extent perfect fertilization. This effect was particularly apparent in the case of plums, cherries and grapes. In certain sections the total or partial failure of the plum and cherry crop is ascribed to this cause.

The crop of fall apples was a heavy one in northern Ontario and parts of Quebec, but brought poor returns, owing to the lack of demand, and frequently to the lack of enterprise on the part of the grower in seeking markets other than local.

The picking of fruit of this perishable character is often delayed till the fulness of maturity is reached; decay soon follows as a consequence of rough handling and close packing.

A considerable quantity of the Wealthy and Alexander varieties have been shipped from Montreal to Britain the past season, with fairly satisfactory results.

Duchess, has also been shipped to England, from Grimsby, Ont., and arrived in fair condition. In order to accomplish this successfully they must be picked before being completely coloured. The successful shipment to Europe of this class of fruits can be accomplished only by the exercise of the greatest care and judgment on the part of the grower in picking, grading, packing and shipping. Considerable discredit has fallen on Canadian apples the past season on account of the wilful or negligent disregard of fundamental principles in packing and grading fruit, viz., to pack with judgment and honesty.

The search for a hardy prolific winter apple of good quality and appearance, adapted to the export trade, still goes on; but no variety with such a valuable combination of good qualities has yet appeared.

In the province of Quebec "Golden Russet" is growing in favour, and will be more extensively planted. The tree is hardy. It is slow in coming into bearing, but it is a regular annual bearer afterwards. The fruit too is always salable and there is no loss from "apple scab" and little from Codlin moth. "La Rue," a large showy early winter apple, originating near Brockville, and introduced by Mr. D. Nicol, of Kingston, is likely to prove valuable. The tree is hardy and vigorous, but Mr. Nicol points out that it must be planted on strong soil, receive good cultivation and liberal manuring; otherwise it will prove unsatisfactory. That real progress is being made in orchard management is evidenced by the rapidly growing interest evinced by farmers and fruit growers in methods of destroying injurious insects and preventing fungous diseases. Spraying with arsenical and copper compounds, is now being practised by the leading fruit growers of the Dominion. A drawback to the rapid extension of this work exists in the fact that we have no large manufacturers of spraying pumps and nozzles in the Dominion. A very serviceable force pump is, however, recently offered for sale by Mr. W. H. Vanduzer, of Grimsby, Ont. Other than this there are none manufactured for this special purpose in the Dominion that I know of. Canadian fruit growers should be able to purchase from home

manufacturers the various kinds of spraying apparatus needed for the destruction of fungus and insect pests, such as hand, knapsack, barrel and horse pumps, fitted with suitable nozzles. In this connection I take pleasure in mentioning a hand pump called the "Victor" sent me for trial by Mr. M. B. Brooks, of Oak Point, N.Y. It possesses the great advantage of not having to be held in or attached to the pail, while pumping is going on. The handle or piston is simply pressed down and lifts itself by means of a spring, thus making its own suction at the same time. If the pump proves durable, it certainly is much to be commended. It is quoted at $3.50.

I have found it impossible in the space allotted me to treat several lines of experimental work which have either been inaugurated or have been in progress during the year. Experiments with vegetables, such as varietal tests, methods of cultivation and effect of fertilizers have been in progress, but the results are held over, till added experience gives them greater weight and renders them more conclusive. During the year a special study has been made of certain hardy varieties of "Morello Cherries" which have been on trial here for the past four years. Bulletin No. 17, published at the close of the year, gives the results of this investigation.

Attention is drawn in the following pages to a consideration of the value of our native plum, as a fruit particularly adapted to the colder sections of the Dominion.

A few of the more destructive fungous diseases are briefly described. The remedies suggested are either the outcome of the results of experiments carried on here, or have been suggested by other workers in this field. This division of the work has been treated at some length on account of the present wide spread interest exhibited in the destruction of these foes to agriculture by farmers and fruit growers generally.

A brief account of the work of distributing forest tree seedlings and cuttings is given, together with some abstracts of letters from parties who have been testing the trees sent out from the Farm. It is a great pleasure to record the unfailing courtesy which I have received at the hands of a number of specialists in horticulture and botany in the United States, to whom I am indebted for much valuable assistance rendered in various ways. I wish to mention particularly "Dr. B. D. Halsted, of New Brunswick, N. J." "Mr. D. G. Fairchild of Washington, D. C." "Prof. F. Lamson Scribner, Knoxville, Tennessee," eminent authorities on plant diseases; "Prof. Goff of Madison, Wisconsin," and "Prof. Bailey of Cornell University, N.Y.", leading horticulturists. Among Canadian co-workers I wish to acknowledge aid given me by Messrs. Dunlop and Brodie of Montreal, Mr. R. B. White of Ottawa, and Mr. L. Woolverton, M.A., editor of the "Canadian Horticulturist." I have also received from Mr. J. C. Chapais, St. Denis, P.Q., Assistant Dairy Commissioner of the Dominion, interesting and valuable notes on the progress of his experimental orchard, which I hope to use in connection with other information now being collected. The experience gained from Mr. Chapais's experimental orchard at St. Denis, Que., will be of much value to fruit growers in the Lower St. Lawrence. It gives me a great deal of pleasure to record the faithful services rendered by Mr. Wm. Taylor, who, as foreman of the horticultural department, has at all times exhibited commendable zeal, care, and perseveranee in carrying on the various lines of work entrusted to his care.

I have the honour to be, sir,

Yours obediently,

JOHN CRAIG,

Horticulturist.

NATIVE PLUMS.

Up to the present very little attention has been given in Canada to the cultivation and improvement of our native plums. Few lines in horticulture, offer greater inducements, however. Comparatively little has been accomplished in the United States by systematic effort, yet since the introduction of the Wild Goose plum about forty years ago, more than 150 varieties have been named and disseminated. This

remarkable increase in number of varieties is only surpassed by the marvellous progress made in the development of the American grape.

The value of the native plum has not yet been recognized to any extent, except in sections where the severity of the climate precludes the easy or profitable culture of varieties belonging to the *Prunus domestica* class. Without doubt, however, there are improved varieties of our native plums which may be profitably grown in all portions of the Dominion, including the most favoured localities. There is a wide variation in regard to the hardiness of these varieties, due principally to climatic conditions prevailing in the place of origin. Thus De Soto, belonging to the *Americana* group and originating in Wisconsin, may be taken as the type of hardiness, while Pottawattamie of the *Chickasaw* family, and introduced from Tennessee, is not hardy at Ottawa.

Up to the present year the botanical status of American plums has been very unsatisfactory. An excellent monograph by Prof. L. H. Bailey, recently published by the Experiment Station of Cornell University, N.Y., has been a great assistance in placing these fruits on a sound scientific basis, and will prove of lasting benefit to those who study the native plum and its variations, from the standpoint of systematic botany.

Formerly our cultivated native varieties were grouped under three wild types, (1) *Prunus Americana*, Marshall, the plum of the north and west. (2) *Prunus angustifolia* or *P. chickasa*, Mich., native of the middle and southern States, and (3) *Prunus maritima*, Wangheim, known as the beach plum of the south. Much confusion existed, however, as many of the cultivated forms could not be satisfactorily assigned to any of these original types. As a result of Prof. Bailey's labours, aided by Prof. Sargent, we shall recognize hereafter another class under the name of *Prunus hortulana*, Bailey. This species is made up of what was formerly known as the Wild Goose group, which in the past was generally referred to the *Chickasaw* tribe. This group now occupies an intermediate position between *P. Americana* and *P. Chickasa*. To these three groups belong practically all our cultivated native varieties in Canada, and from them we may expect important additions to our lists in the future.

As already stated *P. Americana* by reason of its natural distribution extending all over the northern part of the continent to Manitoba, and part of the North-west Territories, contains in its variations the hardiest forms of the plum known to cultivators. These are suitable for culture in the coldest parts of the Dominion, and where nothing in the way of fruits, except the Choke (*P. Serotina*) and Pin cherry, (*P. Demissa*) obtain, it is safe to plant improved forms of the native plum *Prunus Americana*.

On account of this wide distribution touching as it does, Manitoba in the north and Texas in the south, there is much variation in the hardiness of the individuals making up the species, and this, as already intimated, is an important point for the consideration of intending planters.

The following cultivated varieties belong to *Prunus Americana* and have been on trial at the Experimental Farm for the past three years. The illustrations given of these fruits have been engraved from photographs of fruit grown here this season.

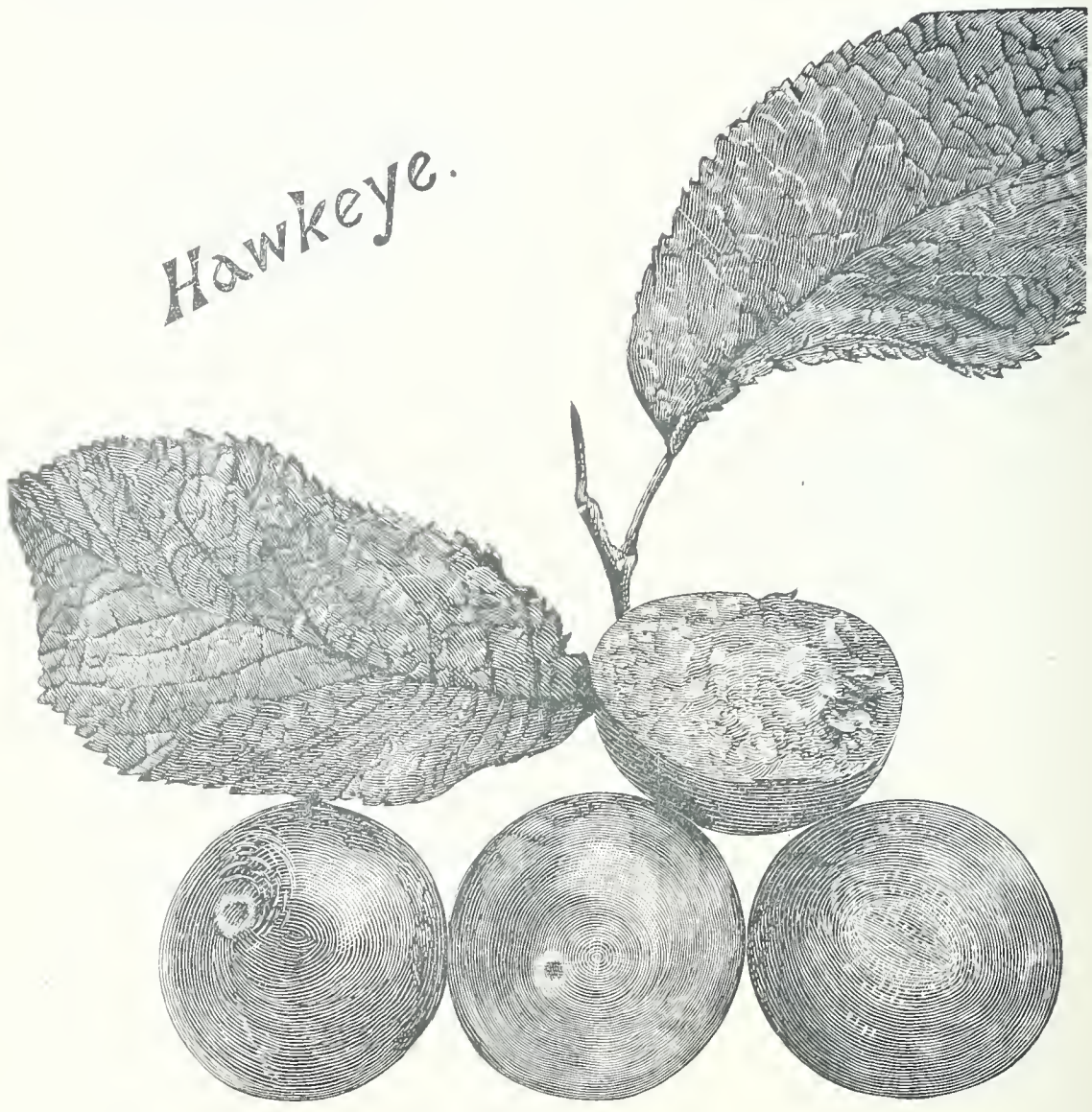
Cheney.—Fruit large, roundish oblong, skin thick, of a dull red color, mottled with yellow. Flesh fairly firm and sweet; quality good. Stone medium size adhering to the flesh. Tree a very vigorous grower, the terminal branches needing shortening annually; remarkably prolific. Ripe at Ottawa the first week of September. This variety originated as a wilding near LaCrosse, Wis.

De Soto.—(Fig. 3.) Fruit medium, to large, round, oblong, sometimes pointed, dark red with a beautiful purplish bloom. Skin thick, flesh juicy, entirely free from astringency. Stone medium size. This is undoubtedly one of the best of the late red plums. Ripening about Sept. 15th. Found wild at De Soto, Wis. Although it was introduced by Elisha Hale of Lansing, Iowa, nearly thirty years ago it has not received the attention which a plum of its excellent qualities deserves.

(Fig. 3.)

Forest Garden.—Fruit medium size, round or slightly egg shaped. Skin thick, yellow, overlaid with darker mottlings, and a light lilac bloom. Flesh yellow, tender with some astringency; fairly good; stone separates readily from the flesh. This tree is a difficult one to manage in orchards, being a rampant grower, throwing out horizontal branches which are apt to break when heavily laden with fruit or during wind storms. Like Cheney the young points of growth need shortening annually

Hawkeye.—(Fig. 4.) Fruit almost round, dark red with lilac coloured bloom, suture indistinctly marked. Flesh deep yellow, firm, juicy. Stone large flat, parts readily from the flesh, equal to De Soto in quality. Ripe Sept. 20th. A valuable late variety which originated under cultivation, and was introduced by Mr. H. A. Terry, Crescent City, Iowa.

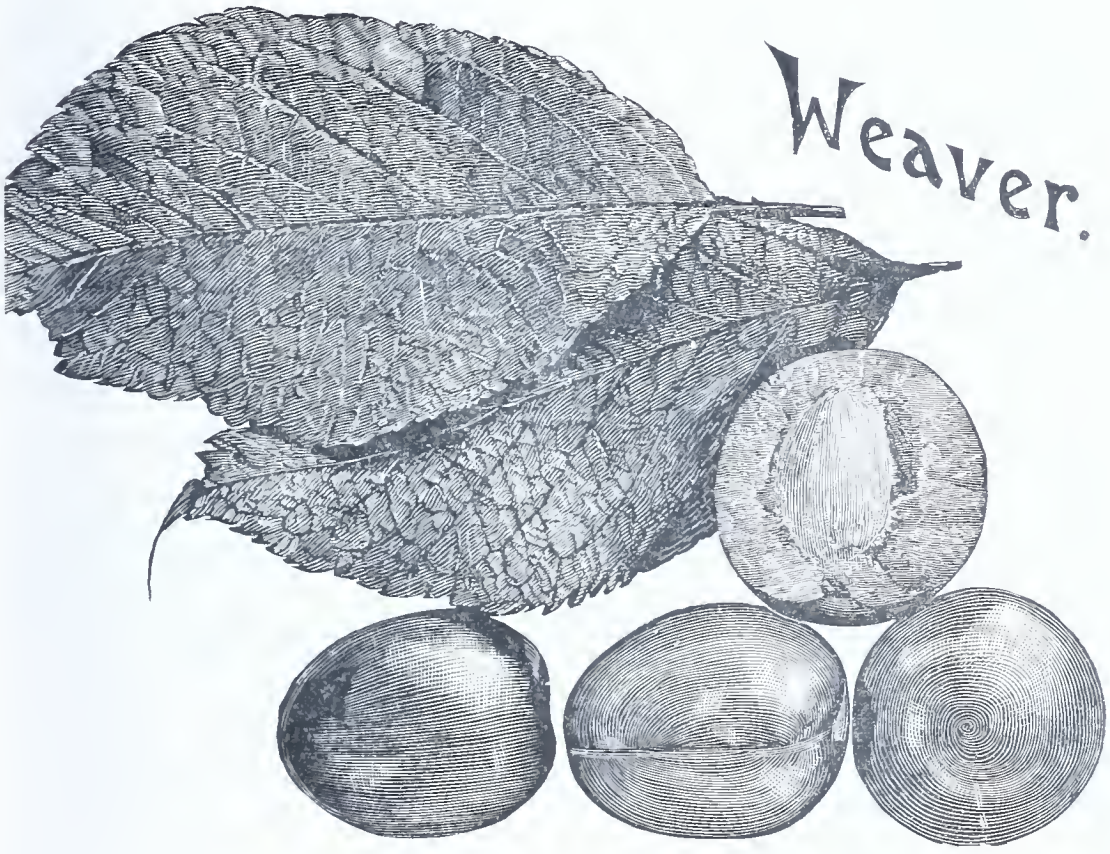


(Fig. 4.)

Ida.—Fruit medium size, oval, with slight suture; skin thick, dark red in colour. Flesh yellow, with little juice; unusually firm for a red plum. Stone, medium size, almost free; fair quality. Hangs well to the tree, and becomes quite sweet and sugary. Ripe soon after the middle of September. Tree hardy and a free grower; originated in Illinois.

Rollingston.—Fruit large, reported very large in some sections; round, flattened at both ends. Skin deep yellow, almost covered with red and purple mottlings. Flesh yellow, firm, good quality. Stone medium to small; cling. Ripens about the middle of September. Found by O. M. Lord, on the banks of Rollingston Creek, Minnesota, and by him introduced into cultivation. This is valuable chiefly on account of its earliness.

Van Buren.—Designated by Prof. Bailey as variety *mollis* of *P. Americana.* The tree is true to the type, but the fruit seems quite distinct, and is among the few red plums having the stone perfectly free. Fruit medium size, roundish oval; skin, thick, yellow with a pink blush. Flesh yellow, sugary, sweet and melting. Picked September 25th this year. It showed a tendency to crack. Not as hardy as any of the preceding. Originated in the State of Iowa.

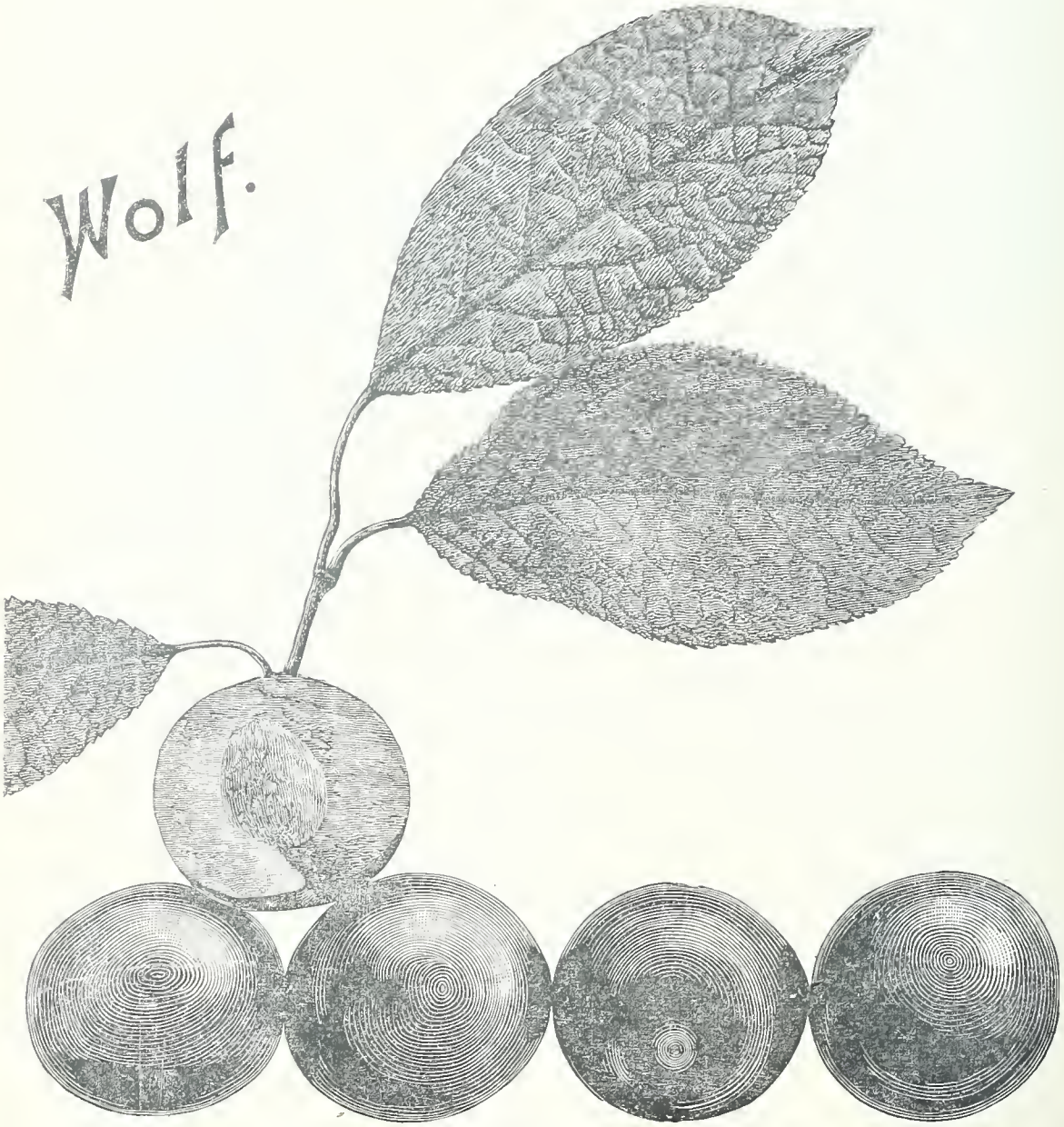


(Fig. 5.)

Weaver—(Fig. 5.) Three trees of this variety planted in 1888, have borne fruit the past three seasons, the last two years very heavily. Fruit large, oblong, flattened, dark red, overlaid with a purplish bloom. Suture well marked; stone long, narrow and flat; semi-cling. Ripens at Ottawa about the end of September. Originated in Northern Iowa, and was introduced by Ennis & Patten, Charles City, Ia., in 1875. This, I believe, will be valuable wherever it will ripen. During the recent meeting of the Ontario Fruit Growers Association at Brantford, the fact that another plum has been introduced in many portions of Ontario under the name of Weaver, was fully demonstrated. The variety fruiting in and about Grimsby, Ont., ripens early in August, whereas the true *Weaver* is one of the latest of the *P. Americana* family.

Wyant.—Tree has failed partially at Ottawa. Fruit of Van Buren type, firm meaty entirely free. Probably more valuable for the South. Prof. Budd describes this as a "free stone variety of great value."

Wolf.—(Fig. 6.) Fruit round, medium to large, dark red covered with dense purplish bloom. Flesh yellow, tinged with red, firm, good quality. Stone separates readily from flesh, a more attractive variety than De Soto, but hardly equal in quality. Tree perfectly hardy, quite distinct from other varieties, having the young shoots heavily covered with a thick pubesence; originated under cultivation in Iowa about 40 years ago. This variety has been widely planted in recent years.



(Fig. 6.)

Yosemite Purple.—A good tree bearing fruit of fair size and quality, but ripening with Rollingston which it does not equal in quality.

Yellow Yosemite.—This is quite similar to the last in appearance, but is a little later in ripening.

The above list includes the best varieties belonging to *P. Americana* which have been fruited at the Central Farm.

VARIETIES RECOMMENDED.

Among those which can be recommended to planters where the finer varieties of *P. domestica* fail, are *Cheney*, *De Soto*, *Rollingston*, *Wolf*, *Weaver* and *Hawkeye*, and if a free stone is desired, *Ida*, *Wyant*, or *Van Buren* may be added.

CHICKASAW PLUMS (*P. Chickasa.*)

Accepting Prof. Bailey's classification as correct, I find that none of the varieties of *P. Chickasa* have proved hardy at Ottawa.

Newman,—which originated in Kentucky some years ago, is one of the best known and most justly popular of this class. It is hardy in Central New York and would probably succeed in Western Ontario. Fruit large, good quality, ripening very late sometimes not before the middle of October.

Pottawattamie.—This highly extolled variety seems to be deserving in many sections of the high measure of praise accorded it. Fruit medium to large, round, light red in color, of good quality. It was introduced by J. B. Rice, of Council Bluffs, Iowa, to whom it came from Tennessee among a lot of Miner plums; not hardy at Ottawa.

Wild Goose Tribe.—*P. hortulana*, Bailey; none of this class are hardy outside of peach growing districts. *Garfield*, *Moreman* and *Wayland* are the most valuable.

Miner has been included as a variety of *P. hortulana*, but it differs so much in general appearance and hardiness of tree as to lead me to believe it to be more nearly related to *P. americana*. This is the oldest native plum known under cultivation. It was raised from seed in Tennessee nearly eighty years ago, and has been widely distributed throughout the Western States. Trees planted eighteen years ago at Abbotsford, Que., are hardy, but as a rule have only given medium crops every other year; ripens early in October. These trees have yielded fuller crops the last few years since being surrounded by seedlings of the Wisconsin wild plum.

Forest Rose belongs to the Miner group but has nothing special to commend it.

Diseases. (See Plum spot p. 102.) They are all more or less liable to attacks of *Septoria*, "shot hole" fungus, but are generally freer than varieties of *P. domestica*. Varieties of *P Chickasa* have exceptionally bright, healthy peachlike foliage. As there are no such things as curculio or knot proof plums, except in a relative degree we may expect to have to fight enemies common to plums when these are planted as with the old varieties.

Propagation.—Varieties of the *Americana* and *Miners* should as far as possible be grown on the stocks of their own type. It is sometimes difficult however, to distinguish scion from stock when these are used. The Chickasaws and Wild Goose Tribe succeed admirably on peach or Marianna stocks and these are preferable to trees on their own roots, on account of their sprouting habits.

Orchard Planting.—Some of the above varieties, Miner and Wild Goose for example, have generally borne larger crops when intermingled with other varieties of plums, for the purpose of more perfect fertilization. While it is not necessary to follow this plan with all varieties—as Wolf and De Soto are always reliable—yet it is a safe principle to practice and one which will generally repay the planter.

POINTS IN FAVOUR OF NATIVE PLUMS.

1. Hardiness and productiveness.
2. Their wide range of adaptability to climatic conditions, and to light as well as heavy soils.
3. Their value for culinary purposes.
4. Their comparative exemption from disease, and the ease with which they can be propagated.

A PARTIAL FRUIT LIST FOR THE PROVINCE OF QUEBEC.

During the year a large number of letters have been received from beginners in fruit growing, asking for information in regard to the best varieties of large and small fruits. As a considerable proportion of these inquiries have come from the Province

of Quebec, I deem it advisable to insert a brief list of the most reliable varieties of large and small fruits suitable to the climate of Quebec and Eastern Ontario.

APPLES—*Summer*—Yellow Transparent, Duchess, Red Astrachan.

Autumn—Alexander, Wealthy; McIntosh Red; Golden White or Titovka (not Tetofsky).

Winter—Pewaukee, Golden Russet, La Rue, Arabka, Longfield, Royal Table.

PEARS—Flemish Beauty, Beurre d'Anjou, Gliva Kurskaya.

PLUMS—Glass Seedling, Blue Damson, Rollingston, De Soto, Wolf.

CHERRIES—Minnesota Ostheim, Montmoreney, Riga No. 18, Wragg, Orel No. 25.

GRAPES—Moore's Early, Herbert, Rogers 17 (black), Lady Hayes, Jessica (white), Delaware, Lindley, Vergennes (red).

GOOSEBERRIES—Downing, Pearl, Houghton.

CURRANTS—White Grape, Red Grape, Moore's Ruby, Versaillaise (white and red), Lee's prolific, Black Naples (black).

RASPBERRIES—See next page.

BLACKBERRIES—Agawam, Snyder, Stone's Hardy.

STRAWBERRIES—Crescent, Wilson, Warfield, Haverland, Bubach.

The above list is only intended to serve the purpose of a guide to beginners in fruit growing within the area mentioned. It is wise in all cases to note carefully in order to ascertain extent of and select from the varieties which have been most successful nearest to the locality, in which fruit growing is to be commenced.

RASPBERRIES.

Few of the many new varieties placed upon the market within the last four or five years possess merit over those already in cultivation. Of a large number tested here, and observed elsewhere, I will mention a few which seem to be decidedly promising; others are mentioned in order to correct opinions of their value which may have been over-estimated. In most cases further trial is needed before their actual value can be determined.

Thompson's Early.—Ripens here usually the second week in June. Is of medium size, round, bright red and attractive. Its earliness seems to be its principal good point. Although hardy it has not been productive.

Columbia.—This has not fruited at Ottawa yet, and I speak of it as seen growing at the New-York Experiment Station, at Geneva, where I was very much impressed with the vigour of the plant, quality and size of the fruit. It has also received favorable commendation at the hands of the able editor of the *Rural New-Yorker.* It is believed to be a cross between the Cuthbert and Gregg, and is intermediate in many characteristics, the fruit being purple and the cane striking root from the tips. Crosses of this parentage, by Mr. Saunders, exhibit the same peculiarities in regard to colour of fruit and method of propagation; it therefore is of the Shaffer type, but the berry is certainly firmer and of better quality, and I am told is a great bearer. This variety originated with Mr. J. T. Thompson, of Oneida, N.Y., who, I believe, controls the stock at present.

Heebner—Is a large red berry of the Clark and Hornet type, in quality it is first class, but not firm enough for distant shipment. It has been on trial at Ottawa for the past four years, having been planted in 1888 by the former Horticulturist (Mr. Hilborn), now of Leamington. The cane is not quite as hardy as Cuthbert but the fine quality of the fruit should give it a place in all amateur collections.

Herstine.—Is another variety which can be recommended for home culture, but is not sufficiently vigorous and productive for market. It is also deficient in pollen, and incomplete fertilization resulting in partially developed berries is occasionally noticed. Herstine and Heebner need winter protection in this locality.

Hansell.—As an early market variety I am inclined to think that this has been underrated It ripens with or before the earliest, and continues giving fair pickings throughout the raspberry season. The berry is of medium size, firm and attractive, bright colour of fair quality. The past two years it has yielded better than Turner.

The cane is not such a strong grower as Turner—needing and paying by increased returns for heavy manuring—but is generally vigorous and quite hardy.

In answer to letters asking for a list of the most desirable varieties for home use the following have usually been recommended :—

For Market:
- Red.
  - Hansell. Very early.
  - Marlboro. Hardy, attractive, poor quality.
  - Cuthbert. Fairly hardy, productive firm, late, good quality.
- Purple. Shaffer. Specially valuable for canning.
- Black caps.
  - Mam. Cluster. Early.
  - Hilborn. Medium early, productive.
  - Gregg. Late.
- Yellow: Golden Queen. Good quality.

For Home use:
- Red.
  - Turner. Early, hardy, good quality.
  - Heebner. Medium; needs protection in this vicinity, fine quality.
  - Hornet. Late, needs protection in this vicinity, fine quality.
  - Cuthbert. Good quality, fairly hardy.
- Purple. Shaffer, canning,
- " Columbia, for trial.
- Black caps.
  - Doolittle. Early.
  - Hilborn, Medium.
  - Gregg. Late.
- Yellow: Brinckle's Orange. Must be protected in winter.
- Golden Queen. Succeeds in the north.

TWO NATIVE GRAPES.

Gibb.

This name has been given to what appears to be a variety of the Canadian Frost Grape, (*Vitis riparia*) which is now cultivated at Abbotsford and St. Hilaire, Que. It seems to have originated as a wilding in the orchard of Mr. Magloire Dery, St. Hilaire, and was brought to Abbotsford about thirty-five years ago by Mr. N. C. Fisk, who planted it in a corner of his garden near a sugar maple. It grew thriftily, soon reaching the top of the tree, and at the present time covers the original tree and two other good sized trees which stand adjacent to it. Since planting this vine, it has not been cultivated or pruned; it has never been injured by winter, and the fruit has always ripened before frost each year. The flavour, however, is not injured by light frosts. * The vine may be described as a fair representative of the wild type *Vitis riparia* of which we have cultivated varieties in a number of seedlings raised by the late Chas. Arnold, of Paris, Ont.

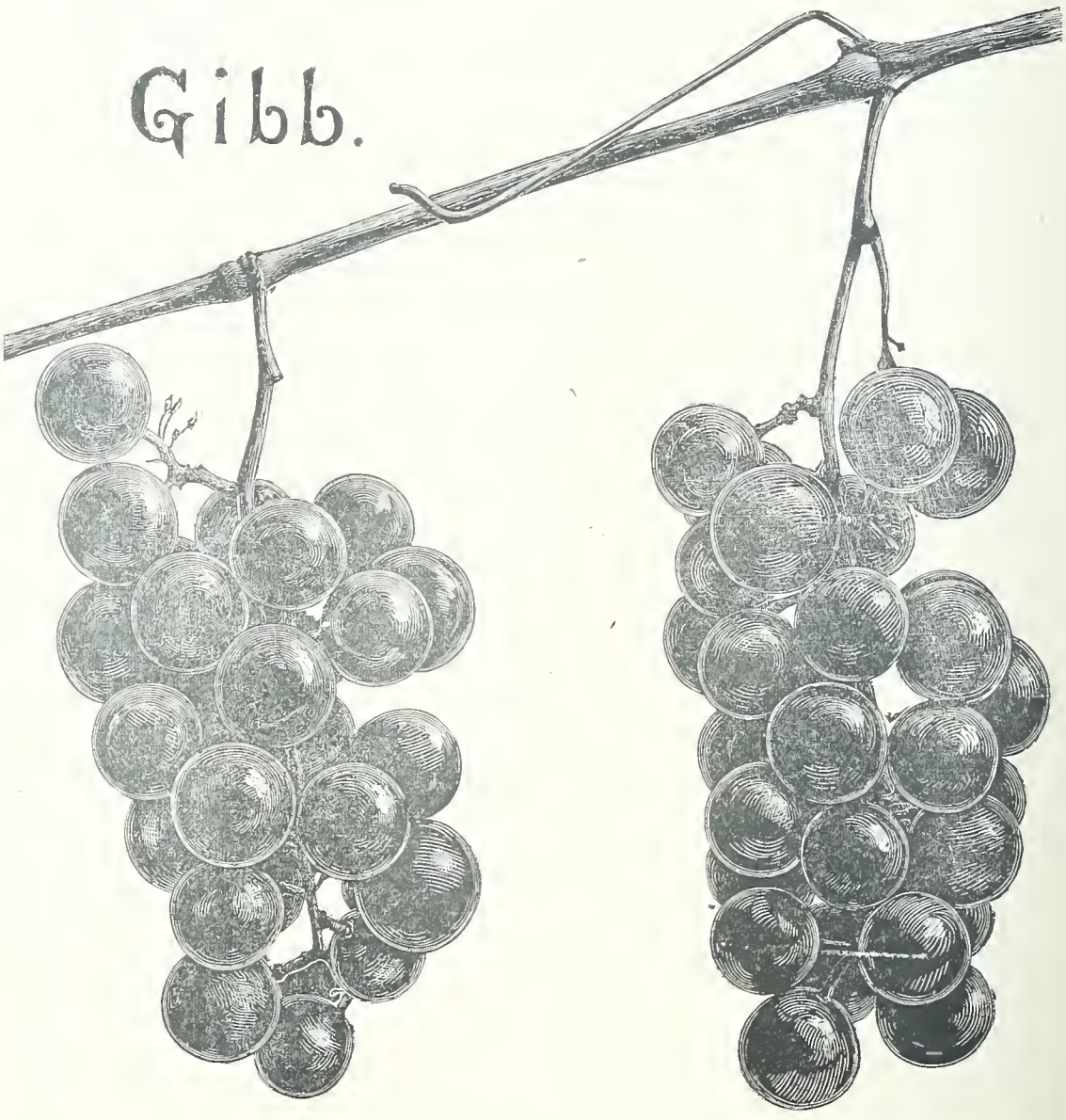


Fig. 7.—In figure 7 two bunches of this grape are shown natural size. Bunch small, rather loose, sometimes shouldered; berry about the size of Clinton, black, with a

* Cuttings were sent to the Experimental Farm four years ago by the late Chas. Gibb, who thought highly of it as an arbor grape.

thick purplish bloom; pulp melting, juicy; seeds few and small; very good. Ripens with or a few days later than Delaware.*

La St. Hilaire.—This variety originated with the late Alexis Dery at the place from which it takes its name, and it is thought by Mr. F. L. Dery who forwarded the sample examined, to surpass the Gibb as a wine grape, and to be more productive. In a letter accompanying samples of fruit of both varieties Mr. Dery says, "the sample of La St. Hilaire sent you is the fruit of a well cultivated and well pruned vine. When properly cared for they will bear from twenty-five to thirty pounds per vine, planted 6x6 feet and trained arbor style on four posts connected by slats." Bunch and berry closely resemble Gibb in appearance. The pulp is tougher with a marked acidity.

The above varieties are noted here because of their probable value for cultivation in the colder sections under ordinary methods, as well as being ornamental and useful in covering arbors or verandahs; and covering stone piles or stone fences, after the method practised by the Rev. Robt. Hamilton, Grenville, and Mr. J. M. Fisk, of Abbotsford, Que., the latter of whom has propagated the Gibb to some extent.

TREATMENT OF FUNGOUS DISEASES.

The excessive rainfall and the humidity of the atmosphere during June and the first half of July rendered the season a particularly favourable one for the development of parasitic fungi, and at the same time increased the difficulty of successfully treating these pests by the ordinary methods of spraying. The almost continual rainfall during the spraying season no doubt prevented many persons who had made arrangements to spray their orchards, from carrying into effect their good intentions.

It should be remembered, however, by every fruit grower that in order to obtain well-developed fruit, the foliage must be healthy, and able to perform all its functions; and further that it is easier in a rainy season by spraying to destroy the form of the fungus attacking the leaf than that attacking the fruit. This may be due to the fact that the spraying compound is not as easily washed off, the more or less hairy surface of the leaf as it is from the comparatively smooth skin of the fruit. By thus preserving the foliage in a healthy condition, not only is the fruit of the current year more fully developed, but the growth of the season more perfectly matured and better fitted for the production of good fruit the following year.

APPLE SCAB.

(*Fusicladium Dendriticum*, Fekl.)

Experiments were undertaken to test the comparative efficacy and cost of Ammoniacal Copper Carbonate and dilute Bordeaux mixture (3 lbs. of copper sulphate and 2½ lbs. of lime) as a remedy for "apple scab." Paris green was added to each mixture at the time of the second spraying.

Conclusions may be summarised as follows:

1. During a rainy season such as the last one, dilute Bordeaux mixture adheres to the foliage better than the Copper Carbonate, and on this account generally gives better results.

2. Bordeaux mixture is more difficult to prepare and apply than Ammoniacal Copper Carbonate.

3. A comparison of the cost of ammoniacal copper carbonate and the diluted Bordeaux, is considerably in favour of the latter.

* Mr. J. M. Fisk, writing of a vine covering a large stone pile on his farm, says, "it was planted about 1875, never has received any cultivation, and for several years back has borne annually about 25 lbs. of fruit which has been sold at 5 cents a pound in St. Hyacinthe as a wine grape; a slight frost improves the quality. I have never seen the least indication of its being injured by our cold winters, not even that part of the vine which entwines itself among the branches of the apple trees near the stone pile, and is exposed to all the changes of temperature of this climate varying from 95° in summer to 30° below zero in winter. On this account I think it will be valuable for the North-west, and for covering arbors."

4. When spraying on a large scale is contemplated, the Copper Carbonate should be prepared according to directions given at p. 146, in the report for 1891. This method will materially lessen the cost of the material.

5. It will pay every fruit grower to spray annually, using judiciously either of the above fungicides.

In this connection, I deem it of importance to append the experience of Mr. R. Brodie, a progressive fruit grower, of St. Henri de Montréal, who writes as follows:

"Our experience in spraying with fungicides this year has been very unsatisfactory on account of so much wet weather, at the time of making the applications. One orchard was sprayed three times with Ammoniacal Copper Carbonate, but it rained a few hours after each application.

There was no apparent difference between these apples and others which had not been sprayed. One day's picking gave 11 bbls. No. 1, 30 bbls. No. 2, and 20 bbls. of culls. Another orchard was also sprayed three times. It rained almost immediately after each of the first two applications, but after the third application there was no rain for ten days. The yield of one day's picking was 10 bbls. No. 1, 10 bbls. No. 2 and 5 bbls. culls. In the case of those trees not sprayed in this orchard they were so badly spotted, that we did not sort them, but merely shook them off the trees.

Another young orchard, favourably situated in a dry airy position, we did not spray, and found them so badly spotted that we shook them off instead of hand picking. Even though the trees were young and vigorous and situated on an airy hill top, they were spotted worse than any on the farm. The season was too unfavourable to make a comparative test of Bordeaux mixture and Copper Carbonate, but so far I think the Ammoniacal Copper Carbonate is the best and much easier applied than the Bordeaux mixture as the lime in the latter is apt to choke up the nozzle."

GOOSEBERRY MILDEW.

(*Sphaerotheca mors-uvae*, B. & C.)

It is gratifying to note among fruit growers the increasing interest taken in the cultivation of the English gooseberry. Hitherto its cultivation has been restricted to localities peculiarly favoured in regard to soil and climate. As a general rule, it has proved unprofitable on account of its susceptibility to mildew of the foliage and fruit.

The efficacy of spraying as a remedy, has now passed the experimental stage, and I have endeavoured during the past season to determine which of the fungicides, found to be effective in preventing the spread of the disease, could be recommended as the most advantageous. The following agents were used:—

1. Potassium Sulphide—(Liver of sulphur.)
2. Ammoniacal Copper Carbonate.
3. Dilute Bordeaux mixture.

Results.

1. No mildew appeared on the fruit of any of the sprayed plants.
2. Plants treated with the Bordeaux mixture had healthier foliage and retained it longer than those treated with Potassium Sulphide, or Ammoniacal Copper Carbonate.

It should be explained, however, that the dropping of the foliage was due in a great measure to the presence of the "shot hole" fungus (*Septoria ribis*), a disease which appeared to yield more readily to the Bordeaux treatment than to the other fungicides.

The experience of a number of correspondents on this subject has been very interesting, and I append an instructive letter from Mr. W. W. Dunlop, formerly secretary of the Montreal Horticultural Society.

OUTREMONT, 9th November, 1892.

DEAR SIR,—In accordance with your request, I send some notes of my experience during the past season in spraying, for the prevention of gooseberry mildew. I

have some twenty English varieties, planted five years ago, and previous to this summer have perceived no traces of mildew on any, with the exception of the Industry. The fruit of this variety has been more or less affected each year and offered me the past summer an opportunity to test the efficacy of the fungicides, recommended in your bulletin. Before the blossoms had fallen, and while the fruit was just forming, I examined my bushes and found that the Industry was already badly attacked. I was surprised at this early development of the fungus, as my previous experience had not led me to expect it until the berries were of a much larger size. Spraying was at once commenced with Potassium Sulphide, one pound to fifty gallons, and carbonate of copper, two ounces (dissolved in one quart of ammonia) to twenty-five gallons of water. As the weather was threatening, only forty bushes were treated the first day, and frequent rain prevented the treatment of the others till some days later. As soon as the weather became settled, the whole of the bushes received two more sprayings at intervals of a week, and I was soon able to perceive with what result.

Both the solutions used appeared to have hurt the foliage to a certain extent, causing in some cases a loss of from 20 to 30 per cent of same, which resulted in a diminished size of the fruit. The progress of the mildew on the bushes first treated was arrested to such an extent that about 90 per cent of the first of these was marketable. There was little difference between those treated with the Potassium Sulphide and the carbonate of copper solution.

The fruit on the bushes treated at a later date, was a total loss.

The injury to the foliage I attribute to two causes. Firstly, a too liberal use of the solution, which was applied with an instrument not having sufficient force to form a good spray and the bushes were thus drenched, not sprayed. Secondly, the application of the fluid to the underside of the leaves which are probably more sensitive than the upper or glazed surface. As it appears necessary, however, to spray the leaves from under to get at the fruit, I am under the impression my solutions were too strong.

From the above practical test, I have been led to the following conclusions :—

1st. That the application of either of the above mentioned fungicides of a proper strength, and before the mildew has developed promises to be attended with success.

2nd. That after the mildew has attained a certain stage of development, the fungicides mentioned have no power to arrest its progress.

Trusting that the experiments now being conducted by yourself and others may lead us again to the successful cultivation of this fine fruit, the English gooseberry.

I remain, yours truly,

W. W. DUNLOP.

The relative cost of Bordeaux mixture and Ammoniacal Copper Carbonate have already been compared and it only remains to add, Potassium Sulphide can usually be purchased at from 30 to 40 cents per pound.

GRAPE MILDEW AND ANTHRACNOSE.

Two diseases of the grape are more or less prevalent in this vicinity.

1st. Grape mildew (*Peronospora viticola*).

2nd. *Anthracnose* or Bird's-eye rot (*Sphaceloma ampelinum*).

They have both been already referred to in the annual reports of the Horticulturist.

As pointed out in the past, No. 1 is amenable to the Ammoniacal Copper Carbonate treatment. The Farm vineyard was sprayed with this fungicide the past season, except three vines each of a few varieties which are peculiarly subject to mildew. These were reserved to compare the efficacy of dilute Bordeaux mixture and Ammoniacal Copper Carbonate. The vines were sprayed three times, the first application being made on May 18th, the second on June 10th, and the third on July

18th. In the case of Noah and Pearl, which in the past have been most seriously affected, the results of the treatment were as follows:—

Noah .	Dilute Bordeaux mixture,	1 vine,	11 lbs.	grapes.
	Am. copper carb.,	1 do	18	do
	Untreated,	1 do	$3\frac{1}{2}$	do
Pearl .	Dilute Bordeaux mixture,	1 do	4	do
	Am. copper carb.,	1 do	$3\frac{1}{4}$	do
	Untreated,	1 do	$\frac{1}{2}$	do

2nd. (*Sphaceloma ampelinum*) "*Bird's-eye rot*," when applied to the fruit, and "*Anthracnose*," when applied to the vine. The attention of grape growers is again drawn to this fungus, not with the object, I regret to say, of reporting a successful treatment of the disease, but to give such a description of its outward appearance and method of attack as will be of assistance to growers in identifying it. In my report for 1891, I said: "Treatment was commenced this fall by carefully burning all rubbish and trimmings, and spraying one half of the vines with a strong solution of Copper Sulphate, and the other half with Iron Sulphate. Next spring, on the vines being uncovered they will be again treated with the copper and iron solution, followed by Ammoniacal Copper Carbonate."

This course of treatment was carefully followed out, but proved quite ineffectual in preventing the spread of the fungus. I shall be glad to obtain the experience of others in treating this disease.

The name *Anthracnose* is usually applied to the stage of the disease when it is attacking the growing vine. It appeared on Creveling about 1st June, in the farm vineyard this season, and soon afterwards on Lindley, Brant, Eldorado, Owasso and Massasoit.

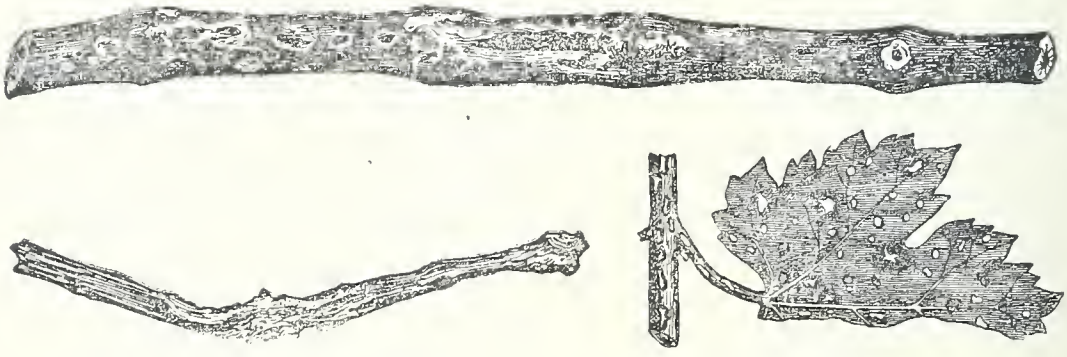


Fig. 8.—Showing Anthracnose on cane and foliage.

Affecting the young shoots, leaf petioles and flowers clusters (see Fig. 8). In general appearance it very much resembles the anthracnose of the raspberry cane, causing the same kind of irregular pits and blotches on all green and growing parts of the vine. After its first appearance the disease spreads very rapidly, and attacking the petioles and the leaves, soon gives the vine a defoliated and unhealthy appearance. In describing the disease on the fruit I draw from Prof. Scribner's excellent work on "Fungous diseases of the Grape and other Plants." "*Bird's-eye rot* first appears as a dark reddish-brown or nearly black speck, on any part of the berry. These specks gradually increase in size to $\frac{1}{8}$ or $\frac{1}{4}$ of an inch, usually preserving a somewhat rounded outline. Their centres soon take on a grayish hue, the dark-brown colour being confined to a narrow line bordering the spots. Sometimes there appears within the dark-coloured border, a band or ring of bright red or vermillion when the spot suggests the name 'Bird's-eye-rot.' (See Fig 9.)

Figures used in illustrating this article have been kindly supplied by Prof. F. L. Scribner, Knoxville, Tenn.

Fig. 9.

"During the progress of the disease there is no general withering, or softening, or browning of the berries, but the tissues beneath the spots gradually lose their turgescence; the cells collapse and become dry and hard. In advanced stages, the berries are reduced to $\frac{1}{4}$ their original size, and usually exhibit the distinct outline of the original spots. Berries when only slightly affected may become misshapen; the parts where the spots are located having ceased to grow; or they may outgrow the effects of the disease, when the only evidence of the spots left, is a gray or brown scurf covering the surface."

"If attacked upon one side when quite small the continued growth of the healthy portion will often cause the diseased side to crack open, laying bare the seeds. The latter are sometimes pushed out by this unequal growth."

"Unlike the downy mildew or fungus of the black rot, the growth of this is limited to the outer layers of cells, developing between the cuticle and the epidermis, or just underneath the latter."

Prof. Scribner says further that: "The spores germinating upon the surface of the berry, send a germ tube through the cuticle or epidermis, beneath which the fungus vegetates for a time, developing into a kind of parenchymatous or cellular growth, which at length breaks through the epidermis. From the now exposed portions of the fungus there arise numerous short branches, called basidia, on which the spores or reproductive bodies are borne."

This more or less superficial growth would naturally lead to the conclusion, as Prof. Scribner observes, that its accessibility to remedies should render the treatment a comparatively easy task. Such however has not been my experience.

A formula for treatment quoted by Prof. Scribner as being recommended by "Le Progrès Agricole," a French agricultural journal, is as follows:—

Water	3 gallons.
Sulphate of iron	7 lbs.
Sulphate of copper	2 do
Sulphuric acid	1 gill.

This solution is to be applied to the vines two or three weeks *before* vegetation starts in the spring. A mixture of this strength and composition would probably be very injurious at any time after growth had commenced, so that in making the application a considerable degree of care and judgment should be exercised.

A system of close pruning is now being adopted on affected vines in the farm vineyard, and spraying frequently at short intervals will be resorted to next season.

Where vines are badly affected they should be rooted up and burned, as they soon become centres from which the disease spreads to other vines.

A Destructive Disease Affecting Native Plums.

(*Cladosporium carpophilum, V. Thümen.*)

During the past two years many complaints have been received from farmers and fruit growers with regard to a disease which has caused their native plums to shrivel and drop quite suddenly, when almost mature. In many sections during the past season the crop has been an entire failure from this cause. As the disease appears to be spreading, it would seem that in the near future, very active measures should be instituted to check its increase.

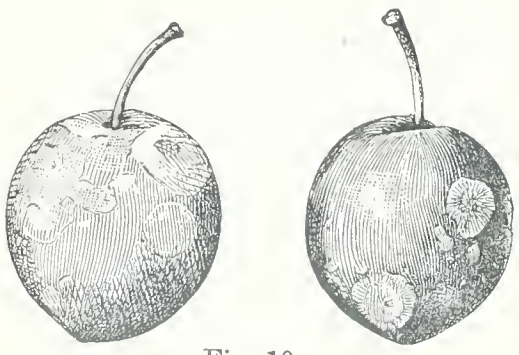


Fig. 10.

Prof. L. H. Pammel, of the Iowa Agricultural College, who has given this disease special study, has kindy supplied me with the following facts:—

"My first acquaintance with this disease as affecting our cultivated plums was in 1889.[1] The disease has appeared to be very destructive to certain varieties of plums since that time, and the fungus has been on the increase.

"This spotting (see Fig. 10) is caused by a parasitic fungus *Cladosporium carpophilum* which is frequently abundant on peaches, especially on the later varieties. So injurious is it to certain varieties that Dr. Smith[2] finds that it not only injures the appearance of the fruit somewhat, but when very abundant the flavour also. I have heard growers in Texas speak of it as nothing serious, but to my mind there is no question that it greatly lessens the crop, and also causes a cracking of the fruit as Dr. Smith finds, making it especially subject to the attacks of plum rot (*Monilia fructigena*)."

"Several other species of *Cladosporium* are troublesome to various cultivated plants."**

"The apple scab (*Fusicladium dendriticum*) is a fungus closely related to this plum fungus[3] which without doubt will seriously threaten plum culture."

"The spots are visible in half ripe plums as small pale greenish, or yellowish patches not larger than a pin head. They increase in size, becoming in some cases half an inch across. Some of the older spots may become confluent, forming one large more or less radiating patch. Patches may also be formed in nearly mature plums. In older specimens which have been kept moist for some time the spot becomes darker in color, almost black, more irregular and somewhat raised."

"Microscopic examination of the affected portions of the plum shows a nearly colourless mycelium creeping over the surface of the fruit, or vegetating between the cuticle and the remainder of the epidermal cells. In the darker portions occur the septate hyphæ. These occasionally come through the cracks in the cuticle. In older material a dense stroma of short brown hyphæ, appears between the cuticle and cellulose layers of the epidermal cells. The small spores are oval in shape pointed at the end usually two-celled, and are borne at the end of the conidiospore, or laterally. (See fig. 11. They germinate readily when placed in water."*

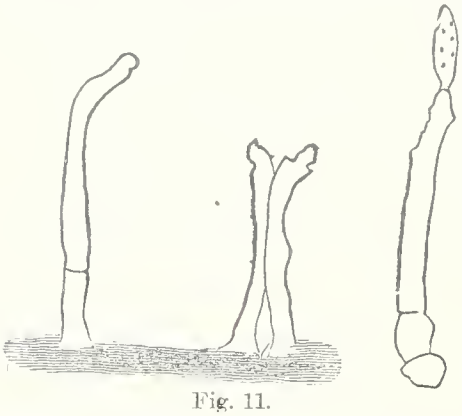


Fig. 11.

"The chief injury caused by this fungus is the cracking of the plums, allowing plum rot (*Monilia fructigena*) a chance to work. The injury, however, does not, except in severe cases, extend much beyond the point of attack, and only a small number of the plum cells become brown. The fungus, no doubt, also checks the development of the plum and in the severe cases it causes a shrivelling and a subsequent dropping of the fruit. The fungus seems to occur on all kinds of American plums. Here at Ames, I have noted it on the following species and varieties: Pottawattamie (*Prunus angustifolia*), Miner (*Prunus hortulana* var. *mineri*) Maquoketa, De Soto, Rollingston, Speer, Chippeway, Black Hawk, Hen Plum (*Prunus*

1. Meeting of Iowa Academy of Sciences September 5, 1890.
2. Journal of Mycology, Vol. V., p. 32.
3. See Bailey. The cultivated native plums and cherries, Bull. 38, Cornell University, Agrl. Experiment Station, p. 54. Pammel, Jour. of Mycology, Vol. VII., p. 99.

*NOTE.—Fig. 9 shows fruiting branches of the fungus coming from the surface of the plum, somewhat irregular at the end where the spores were attached. The figure to the right shows a single fruiting branch with an attached spore at the end and several cells at the base. Greatly magnified-Original. L. H. P.

Americana), and Sloe plum (*Prunus spinosa*). Mr. F. C. Stewart reports this fungus at Greenfield, Iowa, on wild and cultivated plums, in some cases it ruined half the crop. I have also seen it very common on wild plums at Cedar Rapids, Iowa, and Mr. Stewart also found it at Marshalltown, Iowa. Mr. Geo. W. Sturtz reports it at Plainview, Nebraska, and Mr. John Wragg at Waukee, Iowa; and my friend Mr. Craig, of Ottawa, Canada, writes me that it was common in Minnesota on cultivated Cheney, De Soto. Rollingston and Speer; that it also occurs on the common wild plum and cultivated varieties in Canada; also in Virginia on *P. Americana*. It did not appear at the Experimental Farm, Ottawa, in 1891. From this it will be seen that this fungus has become widely distributed and destructive and is certainly on the increase. It did not appear to any extent this year at Ames, except upon a few Chickasaw and sloe plums, as plums fruited but little. I have not seen it attacking (*Prunus domestica*) at Ames. The *Cladosporium* has become in this section a serious enemy also to cherries, first noticed in 1891, when it destroyed from 2 to 10 per cent of the crop. Its first appearance on cherries is marked by a pale coloured spot not larger than a pin head, which increases in size, and finally is olive green in colour. As in plums a crack is frequently found extending across the patch. The cherries become also badly shrivelled in many cases besides being somewhat bitter and sour. We noticed the following varieties affected in 1891, Cerise d'Ostheim, Spate Amarelle, Shadow Amarelle, and Wagner; and in 1892 although the cherry crop was small, the disease appeared on many cherries. My assistant, Mr. Stewart, has furnished me with the following list: Lutovka, Shadow Amarelle, Schatten Amarelle, and Spate Amarelle. It will be noticed that this list only contains Russian varieties, as most of the cherries grown on the college grounds are from Russia. Early Richmond, however, growing not far from the college was not affected by the disease; it may have appeared in other places, but I have not heard of any, or at least specimens were not sent to me."

"Experiments with fungicides would have been instituted this season, but the plum and cherry crop being almost a failure, no experiments could be carried out."

"*Treatment recommended.*—As this fungus works very much in the same manner as apple scab, there is no reason why the fungicides used for that disease should not prove effective. But treatment should begin as soon as the petals have fallen, and should be continued till nearly the ripening period."

In addition to the remedies recommended by Prof. Pammel, I would suggest the use of a weak solution of Copper Sulphate, say 1 oz. in 25 gallons of water. I shall be glad to receive any additional data regarding the progress, spread, and life history of this fungus. It is of special importance to fruit growers in the Ottawa valley, where we are debarred by climatic conditions from growing many of the European family of plums bearing fruit of finer quality, but less vigorous and hardy in tree.

It may be mentioned that this is a new disease, and although it has received considerable attention from economic botanists during the last three or four years, was only described by Felix Von Thümen in 1887.

Plum Rot.

(*Monilia fructigena, Pers.*)

The appearance of this parasite on cultivated plums is too well known to need an extended description. It is not so generally understood that it also attacks cherries, apricots and peaches. In the case of early peaches, it is very destructive; a number of specimens were received the past summer, showing it to be quite prevalent in peach-growing districts. The presence of the disease is not often noticed till the affected fruit has begun to turn brown, and is covered by patches of grayish frosting. This grayish appearance is caused by numberless spores, borne upon the ends of the vegetative portion—mycelium—of the fungus which infests the tissues of the fruit. This disease also attacks the twigs and sometimes stems of bearing trees, causing a kind of twig and bark blight.

Treatment.—Owing to the method of attack, and the fact that the presence of the disease is not noticed till well established in the tissues of the fruit, early treatment is above all other considerations most essential. Prof. Bailey writing in

"Garden and Forest," says that fruit growers in the vicinity of Geneva, N Y., secure paying results by spraying with the copper compounds. I am not aware that any experiments have been conducted in the Dominion which may be accepted as conclusive. Mr. Murray Pettit, of Winona, Ont., kindly furnishes me with his experience in treating plum rot during the past season. He writes: "The sprayed trees were Lombards, planted in orchard, alternately with apple trees. They were considerably shaded and had rotted badly the two previous seasons. This spring they again showed the appearance of rot while quite small. I at once gave them a thorough spraying with sulphate of copper, 2 oz. to 40 gallons of water. This application was repeated in six days. Both sprayings were done at the most fortunate periods with regard to rain. I had very little rot in comparison with other seasons." This, as Mr. Pettit justly remarks, is only the experience of one season, and should not be accepted as conclusive evidence of the efficacy of this remedy. I would recommend a rather stronger solution of copper sulphate than the above—say 2 oz. to 30 gallons of water.

Anthracnose of the Bean.

(Colletotrichum Lindemuthianum Sace.)

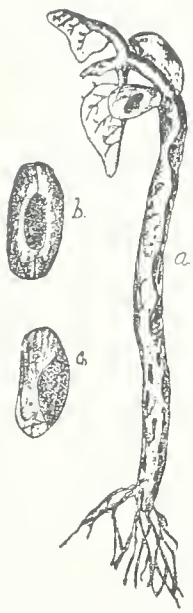


Fig. 12.

The annual loss from the above cause to farmers and market gardeners in this vicinity for the past three or four years has been very considerable. The following experiments were suggested by the results of laboratory investigations conducted by Dr. B. D. Halsted, an eminent authority on fungous diseases of plants, of the State Agricultural Experiment Station at New Brunswick, N.J. Dr. Halsted states that the fungus "most frequently attacks the pods of the bean, when they are only partially grown, and causing the formation of deep dark pits, materially lessens the yield of salable beans from the field infested. Fig. 12 shows seed beans and a young bean plant attacked with anthracnose. The disease spreads rapidly from pod to pod in the market place, as has been shown by repeated inoculations in the laboratory, where under the most favourable conditions, a spot may be established upon an otherwise healthy plant in thirty-six hours." (See annual report, N. J. Expt. Station, 1891, p. 284.) Acting on the belief that the seed beans themselves furnished the principal means for the perpetuation of the anthracnose from one season to another, samples of infested seed were soaked in copper solutions of varying strength. Plants raised from soaked seed showed very little anthracnose in comparison with other seed untreated.

Dr. Halsted obtained the best results from seed soaked for one hour in a solution of "three ounces of Copper Carbonate and one quart of ammonia to 4½ gallons of water."

The following experiments were designated to show, (1) the effect on the germinating power of seed beans of soaking them in solution of copper carbonate and copper sulphate; (2) to test the efficacy of soaking seed beans in the above solutions to prevent "anthracnose" or "pod spotting."

The experiment comprised the treatment of 48 samples, each containing 100 seed beans. These were sown in rows, each 25 feet in length. When the pods were fully formed but yet green, they were picked and sorted, the first grade consisting of *sound pods*, the second of pods *slightly spotted*, and the third of those which were *badly spotted.*

The subjoined tabular statement gives the solutions used; the length of time which each sample was soaked; and the result of each treatment.

Note.—I am indebted to Dr. D. B. Halsted for the use of Fig. 12.

Seed Beans treated for Anthracnose.

Variety.	Solution used.	How long soaked.	Germinated.	Healthy pods.	Slightly spotted pods.	Badly spotted pods.	Average of healthy pods.	Average germinated.
	Sulphate of Copper.		per ct.	per ct.	per ct.	per ct.	per ct.	per ct.
Mohawk	1 oz. to 1 gall.	½ hour.	80·	75·	17·5	7·5		
Long Yellow	1 " 1 "	½ "	90·	56·93	34·09	9·09	64·9	61·2
Flageolet	1 " 1 "	½ "	56·	75·	15·	10·		
Golden Wax	1 " 1 "	½ "	20·	52·68	26·31	21·01		
Mohawk	1 " 1 "	1 "	70·	49·51	29·70	20·70		
Long Yellow	1 " 1 "	1 "	84·	75·	15·	10·	60·8	54·3
Flageolet	1 " 1 "	1 "	40·	80·1	13·3	6·6		
Golden Wax	1 " 1 "	1 "	25·	38·8	29·	32·		
Mohawk	½ " 1 "	½ "	60·	80·	20·	.....		
Long Yellow	½ " 1 "	½ "	92·	65·	30·	5·	65·2	58·
Flageolet	½ " 1 "	½ "	65·	65·76	10·10	14·14		
Golden Wax	½ " 1 "	½ "	15·	50·1	33·3	16·6		
Mohawk	½ " 1 "	1 "	73·	80·14	19·86	.....		
Long Yellow	½ " 1 "	1 "	81·	79·61	12·93	7·46	69·9	60·2
Flageolet	½ " 1 "	1 "	48·	77·20	12·86	9·94		
Golden Wax	½ " 1 "	1 "	40·	43·	23·8	34·2		
Mohawk	Untreated		.....	35·16	43·63	21·21		
Long Yellow	"		95·	62·97	22·22	14·81	43·7	84·
Flageolet	"		75·	41·15	27·21	37·64		
Golden Wax	"		82·	35·9	23·9	20·9		
	Ammoniacal Copper Carbonate.							
Mohawk	1 oz. to 1 gall.	½ "	75·	78·96	13·15	7·89		
Long Yellow	1 " 1 "	½ "	95·	33·66	46·23	20·10	58·79	77·5
Flageolet	1 " 1 "	½ "	75·	68·	16·	13·00		
Golden Wax	1 " 1 "	½ "	65·	54·56	22·72	22·72		
Mohawk	1 " 1 "	1 "	83·	88·88	11·11	·01		
Long Yellow	1 " 1 "	1 "	86·	80·	17·14	2·86	71·68	74·22
Flageolet	1 " 1 "	1 "	63·	71·44	17·85	10·71		
Golden Wax	1 " 1 "	1 "	65·	46·43	25·	28·57		
Mohawk	1½ " 1 "	½ "	76·	89·86	7·83	2·30		
Long Yellow	1½ " 1 "	½ "	91·	50·76	28·92	20·30	64·6	73·75
Flageolet	1½ " 1 "	½ "	80·	61·04	13·14	25·82		
Golden Wax	1½ " 1 "	½ "	48·	57·78	20·	22·22		
Mohawk	1½ " 1 "	1 "	75·	95·	5·	.....		
Long Yellow	1½ " 1 "	1 "	82·	80	15·	5·	79·1	73·13
Flageolet	1½ " 1 "	1 "	66·	80·97	14·28	4·75		
Golden Wax	1½ " 1 "	1 "	60	60·61	24·24	15·15		
Mohawk	2 " 1 "	½ "	45·	78·97	17·85	3·57		
Long Yellow	2 " 1 "	½ "	92·	62·5	31·25	6·25	72·6	51·3
Flageolet	2 " 1 "	½ "	50·	90·52	6·32	3·16		
Golden Wax	2 " 1 "	½ "	20·	58·54	9·51	21·91		
Mohawk	2 " 1 "	1 "	33·	85·53	14·47	.....		
Long Yellow	2 " 1 "	1 "	85·	82·06	10·25	7·69	81·6	54·2
Flageolet	2 " 1 "	1 "	35·	84·	12·	4·		
Golden Wax	2 " 1 "	1 "	65·	75·1	15·6	9·3		
Mohawk	3 " 1 "	½ "	30·	96·	4·	.....		
Long Yellow	3 " 1 "	½ "	89·	67·85	25·	7·14	75·4	45·
Flageolet	3 " 1 "	½ "	46·	85·72	7·14	7·14		
Golden Wax	3 " 1 "	½ "	15·	52·19	26·08	21·71		
Mohawk	3 " 1 "	1 "	32·	92·42	6·06	1·51		
Long Yellow	3 " 1 "	1 "	83·	84·70	9·18	6·12	82·8	43·1
Flageolet	3 " 1 "	1 "	18·	80·1	13·3	6·6		
Golden Wax	3 " 1 "	1 "	40·	74·1	17·3	8·6		

Summary of Results.

Ammoniacal Copper Carbonate.—1. The best results with regard to freedom from spot were often correlated with a low germinating percentage.

2. The results in almost every case were favourable to the Ammoniacal Copper Carbonate treatment.

3. Seed soaked for half an hour in 1 oz. to 1 gallon of water gave the lowest percentage (58 per cent) of healthy pods, and the highest (77 per cent) germinating percentage.

4. Seed soaked for one hour in a solution of 3 oz. to 1 gallon gave the highest percentage (82 per cent) of healthy pods, and the lowest (43 per cent) germinating percentage.

5. As a general rule the percentage of healthy plants was in inverse ratio to the percentage of germination; showing the fungicidal effect of strong solutions, as well as their weakening effect on the germinating power of the seed.

6. The most satisfactory results were obtained by soaking the seed for one hour in 1½ oz. of copper carbonate, dissolved in a pint of ammonia, and diluted with water to one gallon. This gave 79 per cent of healthy plants, with a germinating power of 73 per cent, as against 43 and 84 per cent respectively for the untreated.

Copper Sulphate.—1. The best results were obtained by soaking the seed for one hour in a solution of ½ an oz. to 1 gallon of water, which gave a return of 69 per cent of healthy pods; vitality of seed, 60 per cent.

2. The average results were considerably lower than with the ammoniacal carbonate of copper treatment.

Conclusions and Recommendations.

1. Seed beans can be treated for anthracnose cheaply and advantageously by soaking in copper compounds.

2. Soak the seed beans for one hour before planting, in a solution made by dissolving in a pint of ammonia 1½ oz. of carbonate of copper, and diluting with water to one gallon.

3. When carbonate of copper is not easily obtained, use copper sulphate (blue vitriol) one-half ounce to each gallon of water.

AN EXPERIMENT SHOWING THE EFFECT OF ADDING LIME TO INSECTICIDES AND FUNGICIDES.

It has been claimed that the addition of lime to spraying compounds containing arsenites has allowed of stronger applications of the latter being made than could otherwise be used without danger of injuring the foliage. This assumption, apparently well founded, has been the means of extending the use of Paris green and Bordeaux mixture—which is composed in part of lime—as a combined insecticide and fungicide.

The foliage of stone fruits, as plums and cherries, has been found to be more susceptible to injury from Paris green than the foliage of apple trees. The experiment here outlined was designed to throw light on the following points.

1. The possibility of applying together Paris green and Ammoniacal Copper Carbonate by the addition of lime, without injury to the foliage of fruit trees.

2. The maximum strength which Paris green can be safely applied to the different varieties of stone fruits by the addition of lime.

Some of the detailed results are set forth in the accompanying tabular statement.

Fungicides and Insecticides used and Varieties sprayed.

	Formulæ.	Cherries.			Plums.					Pears.	
		Early Richmond.	Osthcim.	Reine Hortense.	De Soto.	Early Red.	Lombard.	Duane's Purple.	Glass Seedling.	Lutovka.	Double Beurré.
1	Paris Green, 1 oz.. Lime, 1 lb.. .. .... Water, 25 galls....	No injury.	No injury	....	No injury.....	No injury	Very slight injury...	No injury			
2	Paris Green, 2 oz. Lime, 2 lbs.... ... Water, 25 galls....	No injury.	No injury	No injury	Very slight injury.	No injury	Slight injury.....	.....	Very slight injury.	Slight injury	
3	Paris Green, 3 oz.. Lime, 3 lbs.. . Water, 25 galls ...	No injury.	No injury	/.....	Slight injury.....	No injury	Considerably injured	... .	Slight injury.....	Slight injury	No injury

Apples.

	Formulæ.	Duchess.	Wealthy.	Tetofsky.	Yellow Transparent.	McMahon's White.	Canada Baldwin.	Northern Spy.
4	Copper Carbonate, 2 oz.. ... Ammonia, 1½ pts..... .. Paris Green, 2 oz..... .... Lime, 1 lb ... . Water, 25 Galls.....	No injury.	No injury	No injury.....	No injury.....	No injury..		
5	Same as No. 4, but without Lime	Very slightly injured..	Very slightly injured..	No injury.....	Slightly injured...	No injury...	Slight injury....	Slight injury
6	Copper Carbonate, 3 oz. .... Ammonia, 1 quart. .... . . Paris Green, 2 oz..... .... Lime, 1 lb..... .. Water, 25 galls..	No injury.....	No injury.....	No injury.... ..	Slight injury.....	No injury...		No injury
7	Same as No. 6, but without Lime.	Slight injury.....	Considerable injury...	Slight injury....	Slight injury.....	No injury...	Slight injury....	

Two sprayings were made in each case, about a week apart during the second half of June, when the leaves had obtained full size and while growth was still taking place. The results obtained point to the following conclusions :—

1. That the foliage of some varieties is more susceptible to injury from the application of fungicides and insecticides than others.

2. That in the case of apples, 2 oz. of Paris green can be safely added to the ordinary formula of Ammoniacal Copper Carbonate—3 oz. of Copper Carbonate to 25 gallons—when lime at the rate of 1 lb. to 25 gallons is added to the mixture.

3. That the benefit arising from the addition of lime to mixtures of Paris green and water (see table, mixtures No. 1, 2 and 3) is not so apparent when used for insecticidal purposes on plums and cherries, as in the case of combined fungicides and insecticides (see mixtures Nos. 4 and 5 in table.)

4. That the Lombard plum is exceedingly susceptible to injury; and in spraying this variety for curculio, Paris green, stronger than 1 lb. to 400 gallons of water should not be used. Other varieties do not appear to be equally susceptible to injury.

It would appear from the foregoing that the foliage of some varieties of cherries is not injured when sprayed with Paris green with the addition of lime, using the former as strong as 1 lb. to 125 gallons. This is much stronger than necessary however.

DISTRIBUTION OF HARDY ORNAMENTAL EVERGREENS, AND DECIDUOUS TREES; INCLUDING CUTTINGS OF POPLARS AND WILLOWS.

The work during the year in this branch has consisted in making to Manitoba and the North-west a distribution of a limited number of varieties of the hardiest known native or foreign ornamental shrubs and evergreen conifers; also an assortment of cuttings of European willows and poplars, which by reason of their hardiness and rapidity of growth seemed specially adapted to the needs of the North-west.

The primary objects of the distribution were as follows :—

1. To test the relative adaptability of certain ornamental shrubs and evergreen trees to the climate and soil of Manitoba and the North-west; to encourage and assist settlers who wished to beautify, as well as shelter their homes.

2. To provide farmers in the prairie region with the means of obtaining in a short time, wind-breaks for stock yards and gardens, in addition to shelter belts, which are of great service in growing from seed, other varieties of forest trees less vigorous. The poplars and willows, it is hoped may give valuable assistance towards fulfilling these desirable ends.

Ornamental Shrubs and Conifers.

Of these, there were 983 packages distributed, which were made up of plants grown at the Central Farm. Manitoba received 550 packages; 375 were sent to the North-west Territories, and 58 to other provinces. Each package contained :—

30 Riga pine, *Pinus Sylvestris* var. *Rigaensis.*
3 Austrian pine, *Pinus Austriaca.*
1 Scotch pine, *Pinus Sylvestris.*
5 Norway spruce, *Picea excelsa.*
2 Black walnut, *Juglans nigra.*
1 White lilac, *Syringa alba.*
1 Common barberry, *Berberis vulgaris.*
1 Josikea lilac, *Syringa Josikea.* Alternated with,
1 Sweet briar, *Rosa rubiginosa*, and
1 Caragana, *Caragana arborescens.*

The Riga pines comprising the largest share of these packages were well grown stocky plants raised from seed obtained in 1889 by Prof. Saunders from Russia, which were collected in one of the Government forests situated north of Riga. To facilitate early and prompt shipment in the spring the young trees were taken up

the fall previous, and stored in an improvised cellar or cave. They were given the best care possible, under the circumstances, and were sent out apparently in fair condition. In nearly every instance they arrived at their destination in a more or less mouldy state, and consequently very few survived.

It would appear that the germs of fungus growth were present in an incipient stage, when the trees were taken from the cellar in the spring, and only needed the conditions offered by the moist confinement of the mail package to spread the infection. The loss of a large portion of these desirable young trees is much to be regretted.

From reports I gather that most of the shrubs have done well.

Poplars and Willows.

Of these there were distributed 918 packages; 280 were sent to Manitoba and 638 to the Territories. In the making up of these, cuttings of the following varieties were used, from 75 to 100 composing each package.

Poplars.

Populus certinensis.
" nolesti, Riga.
" nolesti.
" Lindleyana.
" pyramidalis.
" bereolensis.
" Simonsii.
" Caroliniana.
" No. 10.
" No. 11.
" Petrovsky.

Willows.

Salix Voronesh.
" laurifolia (from France.)
" acutifolia.
" Wisconsin Weeping.

Appropriate directions for planting and the after care, were mailed to each recipient of the cuttings and shrubs.

These cuttings are of promising hardy varieties which have been introduced from East Europe within the last few years.

They have been selected for the reason that they have proved hardy on the Experimental Farms at Brandon, Man., and Indian Head, N.W.T., and are believed to be specially adapted to the requirements of those farmers residing on the plains of Manitoba and the North-west.

The ease and rapidity with which they can be multiplied gives them additional value. From their quick growth they will be found most useful in providing the shelter needed for starting the cultivation of less hardy but more enduring kinds, of slower growth.

The value of this work will be much enhanced if accurate records are kept of each variety by the individuals receiving them. The close resemblance of many of the poplars will necessitate careful labelling. Reports will be expected when sufficient time has elapsed and experience gained, to give value to the conclusions reached.

Cuttings may be taken from the young trees at the close of the second season's growth. These should be buried in the ground and protected from severe frost during winter. They may be planted the following spring four feet apart, with a view to the formation of shelter belts. With a slight degree of care and attention, a large plantation can thus be readily secured.

That this line of work is meeting with the hearty approval and co-operation of the farmers of Manitoba and the North-west Territories, is demonstrated by several hundred voluntary reports which have come from the recipients of the *Forest* and

Fruit trees distributed during the past three years. The following letters are fair examples of the many which have been received, and illustrate some of the difficulties and successes experienced by the North-west farmer in growing trees.

CLARE, ASSA., N. W. T., 2nd May, 1892.

DEAR SIR,—I beg leave to report on the forest tree seedlings, and fruit trees which I received from the Central Farm last spring. The two Saccharine apples came out well in spring. I tied a bundle of straw round them for a protection at first; they grew about two feet last season. The two White Grape currant bushes died. But one of the Red Dutch currant wintered without protection and is looking very healthy. The Duchess apple trees are both dead. The rhubarb never came up, but the asparagus did very well, also the rose bush. As for the forest tree seed you sent me I am satisfied I have a return of 90 per cent of young trees. The Russian mulberry is a total failure with me.

In regard to the Houghton gooseberry it will be a success in this country if it is protected in winter with something which will retard early growth in the spring. Of the forest trees received in 1891, there are:—

10 Green ash, living.
10 White ash "
25 Box elder "
2 Soft maple, growing well.
20 American elm "
6 Manitoba elm "
2 Black cherry, both dead.
2 Black walnut "
2 Honey locust "
5 White birch, growing well.
3 Canoe birch "
4 Riga Pine, dead.
4 Norway spruce, 3 growing.
1 Arbor vitæ, doing well.

The cherry pits you sent me have not germinated yet, but may sprout this spring. This has been a hard winter to raise fruit trees. The jack rabbits if not fenced out, make serious depredations in our small fruit plantations. We have not been successful so far with strawberries on account of the drouth. I am afraid they will be difficult to grow successfully. I am trying grape vines this spring, and 25 red and white currants. I put out 24 improved currants last spring and I only lost four of them. I am also trying to grow crab apples from seed.

Yours truly,
JOHN BEGGS.

YORKTON, ASSA., NORTH-WEST TERRITORY,
20th September, 1892.

SIR,—Last winter I sent you a report on the seedling forest trees I had received from the Experimental Farm, and promised to give you a further report this season. I am sorry to say that the majority of them were winter killed. The following is a list of the survivors, which have all made good growth this season, and will, I hope, now stand the climate:—

Box elder	2
White ash	4
Green ash	2
Manitoba elm	10

the full number received of this variety.

American elm	1
Mountain ash	2
White birch	5

also the full number received of this variety.

Norway spruce	2

I also received a bag each of box elder (Manitoba maple), and ash seeds, which I sowed early in May, 1891. The maples came up early, and made an average growth of about eighteen inches; none of them were winter killed, and they now stand from three to four feet high. The ash seed was late in coming up, and only about two-thirds germinated and made little growth; but this year in spite of terrible drought the young trees have done well. None were winter killed. I also received a packet of rhubarb and asparagus seed. From the rhubarb seed I got 14 plants, which I transplanted this spring as soon as they began to show above ground, and last week I pulled stalks from these seedlings measuring 4½ inches in circumference and 14 inches in length.

The asparagus did very well, and this spring I set out two beds, thirty feet long, three rows of plants to each bed, set a foot apart each way; and then I had enough plants to give a neighbour sufficient for a large bed. It has made a strong, healthy growth this season in spite of the drought.

Of the trees received this spring I have but a poor report to make, as they were in very bad shape when they arrived, only one Norway spruce, and one Riga pine survived.

Of the shrubs "Caragana" has made a marvellous growth.

"Josikea lilac" did fairly well, white lilac and Barberry both died.

With the poplar and willow cuttings received this spring, the result in a few instances has been very good; in other cases not so good, and with some a complete failure.

The following is a list of the cuttings that grew:—

Populus bereolensis	7 very strong.
Populus certinensis	5 " "
Salix Voronesh	17 very varied in growth.
Salix acutifolia	1 very strong.

At present all the cuttings have several shoots; in some cases they are over eighteen inches in length, and I should like to know if all the shoots should be trimmed off but one.

[If needed for a garden wind-break it is advisable to grow them in bush form, otherwise trim to a single stem.—J. C.]

Yours respectfully,
CHAS. E. F. LOWE.

Beechead Farm, Virden, Man.,
Sec. 6, 75 R, 16 W.,
Ninette P. O., Man.

Sir,—Enclosed you will find in a tabular form the result of trial of forest and fruit trees received from the Experimental Farm at Ottawa, spring, 1890. The result is not very satisfactory, owing to the dryness of the early part of the summer of 1890, also the early fall frosts coming before the young wood was matured. This is a great drawback even to the hardiest of trees in this vicinity.

Box elder, made good long shoots, slightly killed back.

White elm—made good shoots, which were killed back to previous years' wood.

White and green ash— do do

Houghton gooseberries—made, fair shoots, killed back to old wood.

Cuthbert raspberry has a dozen canes from 15 to 20 inches high.

Butternuts, Black walnut, Kentucky coffee tree, and Mulberries, may not survive this winter, as the growth is weakly.

Duchess apple, Red and White currants, are the only things that stood the winter without injury.

I received in spring of 1889 a parcel of Butternuts, none of them have germinated yet. I planted them according to instructions; I also received a parcel of box elder seed this last spring, 1891, and the plants have made but short growth. I have planted box elder seed for several seasons, and it does very well if the seed has

been thoroughly ripened before the fall frosts. I also grew Mulberries and butternuts some years ago, kept them three winters and then lost them.

I desire to lend a helping hand in the matter of tree culture in this North-west country. Until we get shelter belts of the more hardy varieties of forest trees, those less hardy will not be a great success, unless in the more favoured situations.

TABULAR STATEMENT.

—	Planted, Spring 1890.	Alive, Fall 1890.	Alive, Fall 1891.
Box elder	26	20	20
White elm	24	18	18
White ash	10	3	3
Green ash	10	6	3
Soft maple	5	2	
Hard maple	2		
Black walnut	5	4	1
Cotton wood	3	1	1
Honey locust	2	2	
Black locust	2	2	
Kentucky coffee	1	1	1
Apple, Tetofsky	1		
do Duchess	1	1	1
Gooseberry, Houghton	2	2	2
Currant, Red Dutch	2	1	1
do White Grape	2	1	1
Black raspberries, Mammoth Cluster	2		
do Shaffers	2		
do Gregg	2		
Raspberries, Cuthbert	2	1	1
do Hansell	2		
do Turner	2		
Butternut	2	2	2
Red cedar	1		
Russian mulberry	5	3	2
	118	70	57

Soil, black loam with yellow clay subsoil; ground level; a little shelter from east and north, none from west.

Yours respectfully,
JAMES BELL.

NELSON, MAN., Nov. 29th, 1892.

DEAR SIR,—I herewith submit to you a report on the growth of the fruit and forest trees you sent me last spring. I am greatly delighted with the growth of the poplar and willow cuttings. Pop. Lindleyana made the fine growth of over 5 feet, from a cutting in one year. Pop. nolesti, certinensis, pyramidalis and nolesti Riga all made a fine growth of from three to four feet. Only four died out of the thirty received. I am equally pleased with the willows, all of the forty Voronesh but one, grew three to four feet; of Wisconsin weeping, only one is alive; Salix acutifolia all alive, growth three to four feet. Laurifolia, I rank among the ornamentals, the foliage is really pretty. None of the Evergreens have shown any signs of life; the foliage appeared to be mildewed when they arrived here. The White and Josikea lilac are firmly established; the Sweet Briar grew well from the first and was much admired. Of the fruit trees sent I am sorry to report the death of the Lutovka Cherry. Bessarabian looks fine and has made a growth of nine inches. The Baba Pear was sickly all summer, and I have my doubts about it growing next spring. Apple trees are all alive and went into winter quarters with well ripened wood, Hare Pipka and Blushed Calville best in that respect. Sugar Sweet made the most vigourous growth, twenty-five inches; Saecharine four inches. Altogether they are a fine, healthy lot of trees and I am proud of them.

Yours respectfully,
A. P. STEVENSON.

SUMMARY.

From the experience gained thus far in testing the adaptability of varieties of forest trees, and the best means of obtaining shelter belts in the North-west, I deem it advisable to make the following recommendations :—

1st. Rely mainly on native trees.

2nd. Grow these from seed obtained from the nearest point to the intended place of planting.

3rd. Procure when possible cuttings of Russian poplars in the fall, bury them in the earth over winter; setting them deeply in the spring in mellow ground. These are for rapid growing wind breaks and for fuel.

4th. Having a wind break of Manitoba maple, ash, elm, or Russian poplar, begin planting such hardy small fruits as red and white Dutch currants, not omitting the native black currant, Houghton gooseberry, Philadelphia and Turner raspberries; and if the grower is prepared to give special attention in the matter of winter protection and supplying the necessary amount of moisture in summer, plant Captain Jack and Crescent strawberries. With irrigation and protection from the winds these can be grown successfully.

REPORT OF THE CHEMIST.

(Frank T. Shutt, M.A., F.I.C., F.C.S.)

Ottawa, 14th January, 1893.

Wm. Saunders, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the sixth annual report of the Chemical Department of the Dominion Experimental Farms.

As the relation of the science of chemistry to agriculture becomes better known throughout the Dominion, the value of chemical data is more and more appreciated. The publication and dissemination of reports and bulletins (which are now largely copied by the Canadian press) and the yearly addresses delivered at the agricultural conventions and farmers' institutes, have served to awaken a fresh interest in farming throughout the length and breadth of the land. As a natural result of this awakening—of this desire for more exact knowledge regarding the composition and value of soils, fertilizers, cattle foods and dairy products, the demands made upon this department have greatly increased over those of previous years.

This is most encouraging to myself and must be gratifying to those who inaugurated our Experimental Farm system, but at the same time it points emphatically to the necessity of enlarging our staff of skilled workers at no distant date, if the chemical branch of agricultural investigation is to keep pace with the requirements of our farming interests.

As an instance of the growing demands made upon our time, I would state that nearly 1,500 letters have passed between myself and correspondents during 1892. Many of the enquiries (which relate to all the branches of agriculture) entail analytical work, and others require answers that necessitate considerable research. The preparation and delivering of addresses at various conventions held by dairymen and fruit-growers, as well as at ordinary farmers' institutes, consume much time, this branch of my work having greatly developed of late.

Our work, otherwise, consists of experimental research in connection with the Farm system and the solution of such other problems suggested by farmers that are considered of sufficient importance to merit our attention and study.

Besides the matter here reported upon, there are several lines of research still in progress, chief among which may be mentioned the analysis of Canadian grasses and fodder plants and the amelioration of the alkaline soils found in parts of Manitoba and the North-west Territories.

The present report, for convenience of reference, is divided into three parts, as follows:—

Part I. Fodders.—Complete analyses of thirty-seven fodders made during the year are given, and the relative values as feeding stuffs added. The list comprises both "coarse" or "bulky," and "concentrated" foods. Under the former the nutritive value of beans and sunflowers is reported upon. This will be especially interesting at the present time, in view of the proposed introduction of these crops to be used in conjunction with Indian corn in the silo. In the "concentrated" fodders are to be found most of the grains and milling products used on the farm, and in this connection particular attention may be called to the value of frozen wheat as determined by chemical analysis.

Part II. Fertilizers.—The first chapter treats at some length of farm-yard manure, and details some experiments regarding loss of fertilizing constituents on exposure.

Samples of superphosphate of lime, bone meal, bone char screenings, fish manure, and codfish bone, have all been analysed and are here reported upon. Several specimens of marl and of soot have also been examined, and their values as fertilizers are here given.

PART III. MISCELLANEOUS EXPERIMENTS AND ANALYSES.—The results of some original work in composite testing by the Babcock method, whereby the amount of labour and time may be materially lessened, are here stated. As there is now a general desire to adopt the basis of fat content for the valuation of milk, the consideration of the modification here suggested will be of peculiar interest and importance to farmers and dairymen.

The analyses of well waters from farmers' homesteads here find a place, and attention is again called to the necessity of a pure water supply on the farm.

Further experiments in the prevention of smut in wheat are detailed. The results obtained corroborate, on the whole, those reported in 1890 and 1891. Further research as to the effect of lime with bluestone has also been made. Our conclusions appear in tabular form.

The use of corrosive sublimate (mercuric chloride) in dilute solutions as a fungicide and the results of some experiments in the preservation of potatoes by 2 per cent sulphuric acid conclude this part.

I again desire to acknowledge the valuable help rendered by the assistant chemist, Mr. Adolph Lehmann, B.S.A., and, by my thanks here tendered, wish to give public recognition to his ability and industry. His devotion to the work of the department and the skill he has displayed have alone enabled me to complete successfully the chemical operations, the results of which are given in the present report.

I have the honour to be, Sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

Chemical Laboratories,
Central Experimental Farm,
Ottawa.

PART I.

FODDERS.

Cattle foods, according to their composition, fall into two great classes, between which, however, there is no fixed line of demarcation.

The first class includes the coarse or bulky fodders. These are mainly the following:—

Grass and hay, corn fodder and ensilage, straw and roots. Many of these possess a large percentage of water—as in the case of grass, ensilage and roots—and are further characterized by their "dry matter" being comparatively poor in albuminoids and fat. In many, also, the fibre amounts to one-half, or even more, of the dry matter.

The second class comprises the concentrated fodders. Chief among these are the seeds of the cereals and leguminosæ (oats, barley, wheat, peas and beans) and the bye-products of milling and other industries, such as bran, shorts, oil cake, the refuse from starch factories, brewers' grains, &c. They are rich in albuminoids, fat and carbohydrates, and, as a rule, do not contain much fibre nor water, and hence serve to supply in a ration those elements of nutrition which the coarse fodders possess only in small quantities.

The first mentioned fodder crops are usually raised by the farmer in sufficient quantities for his own stock, while, for many reasons, it often happens that a large proportion of the concentrated feed stuffs must be purchased, and this is more especially the case with the dairyman and stock raiser. Since the coarse fodders, though serving a very important function in all rations, are not economical nor efficient to

feed alone, but must be supplemented by those of a richer character, a knowledge of the composition of fodders, and of the relative value for feeding purposes of their several constituents becomes necessary. This is the more evident as the market price of the concentrated fodders fluctuates, and is based, not upon their feeding value, but upon the relation of supply and demand.

In former reports we have dwelt at length upon the functions of the different food constituents in the animal system; it will therefore suffice now to briefly state the more essential facts in this connection.

Albuminoids.—A collective name applied to the nitrogenous organic substances. They are the most valuable of all fodder constituents. They are essential to the formation of muscle, cartilage and the tissues generally, and of the animal fluids, blood and milk. Though their principal office is repairing waste and making new tissue, they also serve to develop heat and energy when fat and the carbo-hydrates are lacking or in insufficient quantities. Whether animals are laying on flesh, producing wool or milk, or working, a supply of albuminoids is necessary, and experience has shown that economic feeding chiefly consists in obtaining them at a minimum cost and feeding them in sufficient quantities.

Fat.—This ingredient has a high nutritive value, and in this respect ranks next to the albuminoids. By its combustion it generates the greater part of the heat of the body. Further, it is readily transformed into fatty tissue in the animal.

Carbohydrates—Consist of sugars, starch, gums and allied substances, and form a large percentage of the organic matter of plants. They are readily assimilated and oxidized in the animal system, producing much heat and energy.

Fibre.—Compared with the constituents already discussed, fibre has a low nutritive value. It forms the woody parts of the stems and leaves of plants and of the hull or husk of seeds. As a rule the fibre becomes harder and less digestible as the plant approaches maturity.

Ash or Mineral Matter.—This contributes to the formation of bone and supplies the tissues throughout the body with the minute quantity of mineral matter they require. It also replaces those saline substances daily excreted.

The question of economic feeding is intimately related to that of maintaining and increasing the fertility of the soil. This becomes evident when we remember that the greater portion of the fertilizing elements (chiefly nitrogen, potash and phosphoric acid) of a food, are returned in the manure. It is for this reason that a ration with a high percentage of albuminoids gives a manure rich in nitrogen and *vice versa.* Unless manure or artificial fertilizers are bought, a large percentage of the produce should be fed on the farm. The soil may then be expected to yield lucrative crops and at the same time not deteriorate.

Again, economic and efficient feeding can only result from the application of a knowledge of the composition and feeding value of our principal fodders and a due consideration of their market prices, which latter it may be added is not always in accord with nutritive value. It is to afford this knowledge that during the past year some of the principal fodders, both "coarse" and "concentrated," have been examined in our laboratories—the results of which are set forth in the following table. The constituents are recorded in percentages and in pounds per ton.

	Fodder.	Locality.	Water.		Albuminoids.		Fat.		Carbohydrates.		Fibre.		Ash.		Dry Matter.	
			Per cent.	Lbs. per ton.	Per cent.	Lbs. per ton.	Per cent.	Lbs. per ton.	Per cent.	Lbs. per ton.	Per cent.	Lbs. per ton.	Per cent.	Lbs. per ton.	Per cent.	Lbs. per ton.
1	Oats, ground	C. E. Farm, Ottawa	12·68	253·6	10·44	208 8	3·22	64·4	59·93	1199·6	10·79	215·8	2·94	58·8	87·32	1746·4
2	Barley "	"	13·75	275·0	9·12	182·4	1·89	37·8	67·75	1355·0	5·09	101·8	2·40	48·0	86·25	1725·0
3	Wheat " No. 1 Hard	Manitoba	9·08	181·6	13·83	276·6	2 03	40·6	71·51	1430·2	1·94	38·8	1·61	32·2	90·92	1818·4
4	" frozen, A.	"	14·75	295·0	13·50	270·0	2·22	44·4	64·57	1291·4	3·31	66·2	1·65	33·0	85·25	1705·0
5	" " B.	"	11·14	222·8	13·69	273·8	2·57	51·4	66·57	1331·4	4·32	86·4	1·71	34·2	88·86	1777·2
6	Pease	C. E. Farm, Ottawa	15·00	300 0	23·69	473·8	·85	17·0	50·16	1003·2	7·87	157·4	2·43	48·6	85·00	1700·0
7	Ind. Corn, Pearce's Prolific	From Pearce & Co., London, Ont.	14·14	282·8	9·66	193·2	4·13	82·6	68·75	1375·0	1·92	38·4	1 40	28·0	85·86	1717·2
8	" Longfellow	" "	13·78	275·6	9·59	191·8	4·19	83·8	69·17	1383·4	2·14	42·8	1·13	22·6	86·22	1724·4
9	" Thoroughbred White Flint	" "	16·03	320·6	9·06	181·2	3·05	61·0	68·80	1376·0	2·03	40·6	1·03	20·6	83·97	1679·4
10	Wheat Bran	Yarmouth, N.S.	8·42	168·4	15·22	304·4	4·27	85·4	56·68	1133·6	9·81	196·2	5·60	112·0	91·58	1831·6
11	Corn "	"	7·19	143·8	10·75	215·0	8·60	172·0	57·83	1156·6	11·91	238·2	3·72	74·4	92·81	1856·2
12	Rice Meal	Victoria, B.C.	11·47	229·4	11·34	226·8	12·75	255·0	50·31	1006·2	6·95	139·0	7·18	143·6	88·53	1770·6
13	Straw, Oat, B. T	C. E. Farm, Ottawa	6·78	135·6	3·31	66·2	2·54	50·8	40·15	803·0	42·01	840·2	5·21	104·2	93·22	1864·4
14	"	"	7·11	142·2	3·11	62·2	2·74	54·8	37·10	742·0	44·34	886·8	5·60	112·0	92·89	1857·8
15	"	"	6·93	138·6	3·32	66·4	2·17	43·4	37·63	752·6	44·07	881·4	5·88	117·6	93·07	1861·4
16	" W. R.	"	7·99	159·8	5·88	117·6	1·69	33·8	38·00	760·0	42·09	841·8	4·35	87·0	92·01	1840·2
17	"	"	8·31	166·2	5·50	110·0	1 93	38·6	38·38	767·6	41·95	839·0	3·93	78·6	91·69	1833·8
18	"	"	7·84	156·8	3·29	65·8	1·74	34·8	37·12	742·4	45·24	904·8	4·77	95·4	92·16	1843·2
19	Straw, Barley, P. P.	"	7·85	157·0	3·90	78·0	2·17	43·4	38·48	769·6	42·46	849·2	5·17	103·4	92·15	1843·0
20	"	"	7·83	156·6	4·02	80·4	2·17	43·4	40·68	813·6	40·39	807·8	4·91	98·2	92·17	1843·4
21	"	"	10·61	212·2	3·85	77·0	2·00	40·0	37·33	746·6	41·12	822·4	5·09	101·8	89·39	1787·8
22	" D. C.	"	8·18	163·6	3·48	69·6	2·42	48·4	38·32	766·4	43·56	871·2	4·04	80·8	91·82	1836.4
23	"	"	8·84	176·8	3·99	79·8	3·16	63·2	38·31	766·2	41·78	835·6	3·92	78·4	91·16	1823·2
24	"	"	8·26	165·2	3 69	73·8	2·72	54·4	39·50	790·0	41·98	839·6	3·85	77·0	91·74	1834·8
25	Straw, Wheat, C. T.	"	7·82	156·4	5·64	112·8	1·38	27·6	36·53	730·6	44·56	891·2	4·07	81·4	92·18	1843·6
26	"	"	8·29	165·8	4·48	89·6	1·74	34·8	38·19	763·8	43·64	872·8	3·66	73·2	91·71	1834·2
27	"	"	8·34	166·8	6·21	124·2	·96	19·2	35·98	719·6	44·46	889·2	4·05	81·0	91·66	1833·2
28	" R. G.	"	7·98	159·6	3·16	63·2	2·88	57·6	38·05	761·0	44·75	895·0	3·18	63·6	92·02	1840·4
29	"	"	7·87	157·4	3·56	71·2	2·01	40·2	36·07	721·4	47·29	945·8	3·20	64·0	92·13	1842·6
30	"	"	8·00	160·0	3·73	74·6	1·94	38·8	37·12	742·4	45·38	907·6	3·83	76·6	92·00	1840·0
31	Beans, whole plant, Broad Windsor	"	84·52	1690·4	2·82	56·4	·62	12·4	5·89	117·8	4·84	96·8	1·31	26·2	15·48	309·6
32	" "	"	84·59	1691·8	3·33	66·6	·63	12·6	5·67	113·4	4·14	82.8	1·64	32·8	15·41	308·2
33	Beans, English Horse	"	89·24	1784·8	2·75	55·0	·73	14·6	2·26	45·2	3·71	74·2	1·09	21·8	10·76	215·2
34	" "	"	86·15	1723·0	2·69	53·8	·66	13·2	4·17	83·4	4·98	99·6	1·35	27·0	13·85	277·0
35	" whole plant, Telephone	"	83·81	1676·2	2·99	59·8	1·00	20·0	6·79	135·8	3·70	74·0	1·71	34·2	16·19	323·8
36	Sunflowers, stalks and leaves	"	84·45	1689·0	·96	19·2	·87	17·4	6·12	122·4	5·67	113·4	1.93	38·6	15·55	311·0
37	" head with seeds	"	75·62	1512·4	2·35	47·0	4·86	97·2	7·88	157·6	7·94	158·8	1·35	27·0	24·38	487·6

CONCENTRATED FODDERS.

No. 1. Oats.

The percentage of hull, which in the case of the oat is consumed by the animal with the kernel, is usually from 30 to 35. Some difference in composition exists between the varieties of oats, chiefly due to the fact that the amount of the hull is dependent largely upon the variety. The less hull, the higher the albuminoids. Compared with the other cereals we notice (1) that in albuminoids (the most important and valuable of all the constituents) oats stand higher than barley and lower than wheat, and (2) that oats are richer in fat than either of the last mentioned cereals. Experiments have shown them to have a very uniform digestibility, and experience has proved them to be the best food, in conjunction with a proper amount of bulky fodder, for working horses. These excellent qualities are no doubt largely due to the loose, mealy character of the ground grain, which allows the digestive fluids to act freely.

No. 2. Barley.

The more plump and better coloured grades of barley must be considered too expensive for feeding, since they command a high price for malting purposes. It often happens, however, that unpropitious weather during harvesting, and other circumstances, cause a more or less shrivelled and badly coloured grain. It may be found more economical to feed such grain than to sell it. The percentage of albuminoids in such barley is higher than in that of the best malting grades, and hence it is more valuable as a food. Speaking of barleys as a class, their albuminoids and fat are lower than in the other cereals. Barley does not contain as much hull as oats, hence its amount of fibre is much less, though still greater than that in wheat. Owing to this lack of hull principally, the practice of grinding barley and mixing it with cut clover is widely adopted. This gives greater bulk to the fodder and thus furnishes an increased surface of the concentrated portion of the feed to the solvent action of the digestive secretions.

No. 3. Red Fife Wheat.

This represents the average composition of Red Fife wheat from Manitoba, classed No. 1 hard. The high percentage of albuminoids and the small quantity of water point emphatically to the high feeding value of this grain. The unrivalled reputation which this wheat bears for flour production, naturally makes it too valuable to use as a cattle food. Its analysis is inserted here for the sake of comparison with the analyses of frozen wheat—two of which immediately follow.

Nos. 4 and 5. Frozen Red Fife Wheat.

It sometimes happens that early autumnal frosts in Manitoba and the North-West Territories deteriorate large quantities of wheat. This has hitherto been sold by the farmers at a great sacrifice, as the millers value it at an exceedingly low figure for their purposes. From experiments tried at the Central Experimental Farm, Ottawa, by Mr. Jas. W. Robertson, Agriculturist, it has been proved that frozen wheat may be used profitably for the fattening of swine, (See Bulletin 16). The analyses here given were made on the same wheats as used in those experiments, and are therefore of particular interest.

First, it will be noticed that frozen wheat contains more water than wheat properly and favourably matured. This is as might be expected, since the development of the frozen grain is arrested while it is yet more or less in the doughy state. The albuminoids, though somewhat lower, have not suffered materially. They still exceed the percentage found in soft fall wheats. Other and noticeable features are that the carbohydrates are 5 per cent to 6 per cent lower and that the fibres somewhat higher in the frozen wheat, than in the No. 1 hard. Considered from the standpoint of composition, I think we may conclude that frozen wheat as a cattle food does not rank as much inferior to well ripened and mature grain.

No. 6. Pease.

Pease are characterized by a very high percentage of albuminoids, approaching one quarter of their weight. They are remarkably poor in fat, and possess less carbohydrates than the cereals. For these reasons, it becomes necessary to supplement them with some more bulky and less nitrogenous fodder, in order that a proper ratio of the various constituents may be maintained, the digestive fluids allowed to act freely, and the health of the animal not impaired.

Nos. 7, 8 and 9. Indian Corn.

These are the analyses of the grain of well known varieties. The merits of corn meal as a feeding stuff are widely recognized. It produces much animal heat and possesses special value as a fattener. In the United States it is very extensively used for all classes of animals; over certain large areas it forms almost exclusively the "concentrated" fodder employed.

With the exception of malting barleys, corn ranks lower in albuminoids than the cereals, and possesses, according to our analyses, a larger percentage of water. In fat, however, it is richer.

Like other foods of a similar concentrated character, it should be fed in a ground condition, and be supplemented with more bulky food. It may here be noted that experiments have demonstrated that a greater proportion of a concentrated fodder is digested when the same is fed in a ground condition and mixed with cut hay or similar fodder, than when given whole and alone; and further, that the health of the animal is also the better maintained thereby.

No. 10. Wheat Bran.

According to the method of milling used, the composition of bran will vary within slight limits. The present analysis, however, may be considered an average one. It supports the general belief that bran has a high nutritive value. The percentage of albuminoids in bran exceeds that in the whole grain, owing to the gluten granules lying more particularly in the outer coat of the kernel. In fat also, it is richer than the whole wheat. It possesses a larger amount of fibre, as might be expected. Careful experiments have shown that in digestibility bran is equal to the grains; its use, therefore, rather than that of these more costly foods, must be considered economical. It has *special merits as a milk producer*, and is consequently fed with advantage to milking cows.

No. 11. Corn Bran.

This is a bye-product formed in the milling of Indian corn. Compared with wheat bran it is seen to be richer in fat, but considerably poorer in albuminoids. It is about equal to it as regards soluble carbo-hydrates, but possesses somewhat more fibre.

No. 12. Rice Meal.

This sample was sent by a correspondent in Salt Spring Island, B.C., who says that the rice comes direct from China, and is ground at Victoria. He further adds that it is extensively used as a food for hogs and cattle in his neighbourhood, owing to the very high price of oats, pease and other grains.

The whole grain—hull and kernel—is evidently ground, since the meal is of a yellowish colour, and contains pieces of the husk. It is in a very satisfactory degree of fineness.

From the analysis, I should judge it to be a valuable food. Though it does not quite equal wheat bran in albuminoids, it is seen to contain a higher percentage of fat.

COARSE FODDERS.

Straw.

There now follow analyses of eighteen samples of the straw of the cereals; oats, barley and wheat. Two varieties of each have been examined, the samples being taken at three different stages in the growth of the plant.

The composition, and hence the value, of straw is dependent upon many factors, and according to circumstances, varies within comparatively wide limits. These factors are, chiefly, the richness of the soil, the manner of sowing, the maturity of the plant when cut, and climatic conditions during harvesting.

Good straw is a valuable fodder, but should never be used alone. As regards digestibility it is not much inferior to other coarse feeding stuffs. It is not, however, rich in albuminoids or fat, and consequently can only form a portion of any economical cattle ration. The nutritive ratio (that is the proportion of digestible albuminoids to the other digestible constituents taken together) of good straw varies from 1:25 to 1:30. Since in a properly balanced ration, this ratio is between 1:5 and 1:6, the mistake often made in feeding straw alone is apparent.

Nos. 13, 14 and 15, oat straw, variety, Black Tartarian.
" 16, 17 and 18, " " White Russian.
" 19, 20 and 21, barley straw, variety, Prize Prolific.
" 22, 23 and 24, " " Danish Chevalier.
" 25, 26 and 27, wheat straw, " Campbell's Triumph.
" 28, 29 and 30, " " Rio Grande.

Sunflowers and Beans.

The analyses Nos. 31 to 37 are of certain new fodder crops, cut in the green condition. They consist of sunflowers and three varieties of beans. In the case of the former, the analyses of the stalks and leaves (taken together) and of the heads with seeds, are given separately. With the beans, the whole plant (leaves, stalk and pods) was analysed.

These crops were grown on the Central Experimental Farm, Ottawa, during the past season by Mr. Jas. W. Robertson, Agriculturist, with a view of using them as ensilage. Corn ensilage is too poor in albuminoids to allow it to form more than a part of any ration; the bean plant ensilage, if in good condition and palatable to cattle, would furnish a large proportion of these important constituents, as it comes nearer to the composition of a complete food. With regard to the sunflowers, their value was more or less conjectural, as no analysis of these could be found, though it was well known that their seeds contained a large quantity of oil.

Beans.

Nos. 31 and 32. The Long-pod or Broad Windsor Bean.

Cut, August 11th. Grown on light sandy soil, in rows *per se*. The plants were about three feet high and the pods half mature.

No. 32. The same plant taken August 13th, but grown in rows with corn. The plants were about three feet high and in pod.

For a green fodder, and one containing nearly 85 per cent of water, it is remarkably rich in albuminoids. No deterioration in value by growing with the corn is seen to have taken place, but rather the reverse, the albuminoids being somewhat higher and the fibre lower in those plants grown with the corn.

No. 33. The English Horse Bean.

Grown on light soil, in rows with corn. Height of plant when cut about three feet. In flower.

It is of the same general character as those already considered, but contains more water and less fibre, doubtless owing to the fact that it was taken at an earlier period of growth.

No. 34. The English Horse Bean.

Grown under exactly similar circumstances to No. 33, but cut at a later period of growth, viz., when the plant was about three feet six inches high and the pods about one-third matured.

It consequently contains more dry matter than No. 33, and possesses a higher percentage of fibre.

No. 35. The Telephone Bean.

Grown with corn, in rows. Cut while in pod and quite green, on 27th September From its composition and succulent character, it is undoubtedly valuable fodder.

A ton of good corn ensilage contains from 35 lbs. to 40 lbs. of albuminoids; a ton of bean ensilage, from 55 lbs. to 70 lbs. A mixed ensilage from corn and beans, therefore, will have a much higher feeding value than one from corn alone.

The use of such a mixed ensilage would effect a considerable saving in the meal portion of the ration, since the albuminoids would thereby be largely supplied.

Sunflowers.

Three plants were cut, on 9th September, at about one inch from the ground. The stems were still quite green and apparently succulent. The following weights and measurements were then taken.

	Lbs.	oz.
Stalks and leaves	6	10
Heads with seeds	3	11
Seeds alone	1	$4\frac{3}{4}$
Receptacle and petals	2	$6\frac{1}{4}$
	Feet	in.
Height	6	10
Diameter of heads		$8\frac{2}{3}$

No. 36. Sunflower stalks and leaves.

These contain but very little nutriment, being low in albuminoids and fat and containing a large percentage of water. Though still green their fibre was of a woody nature. Their food value is exceedingly low.

No. 37.—sunflowers—heads with seeds.

A marked difference is to be noted between this analysis and the previous one. The water is 10 per cent less, the albuminoids nearly three times higher, and the fat six times greater than in the stalks and leaves.

The "heads with seeds" would not furnish an ensilage as rich in albuminoids as that from beans, yet in this respect it would be considerably more valuable than that from corn alone. In fat, however, the "heads with seeds" ensilage is very much richer than that of either corn or beans.

Granting that the fibre of the "heads with seeds" is fairly digestible, the indications are that a well balanced and nutritious ensilage may be made by mixing the three crops, corn, beans and sunflower "heads with seeds" in the silo. The first would supply the large bulk of the carbohydrates, the second, the albuminoids chiefly, and the last, fat and albuminoids.

PART II.

FERTILIZERS.

The factors that conduce to luxuriant growth and plentiful harvests are (1) an abundant supply of available plant food in the soil, and more especially of nitrogen, phosphoric acid and potash; (2) a right mechanical condition of the soil; and (3) favourable climatic influences. It is in connection with the first of these that we shall here consider briefly the relative merits of some materials of manurial value examined in the laboratories during the past year. To all who are anxious to progress towards a greater and more economical crop production, the fundamental importance of the subject will commend the careful perusal of this chapter.

For the present purpose, it may suffice to note that of all the constituents necessary for plant growth and development, nitrogen, phosphoric acid and potash are the most essential, since continuous cropping exhausts the soil more particularly of soluble, and hence of available, forms of these ingredients. Organic matter, lime, sulphuric acid and many other substances are not only useful but indispensable, but for the reason just stated may be considered of secondary importance.

Nitrogen as it exists free in the atmosphere can only be utilized, as far as is known, by certain plants known botanically as the Leguminosæ, to which pease, beans, clover, &c., belong. Under favourable conditions such plants have the power of utilizing large quantities of free nitrogen and storing it in their tissues. Hence their value as a crop to be turned in as green manure. Other farm crops must depend upon the supply of nitrates in the soil for their nitrogen. The nitrates are soluble and readily absorbed by the rootlets. The nitrogen of a soil may exist in many forms (organic, as in vegetable and animal matter, and inorganic, as in salts of ammonia, &c.), but before such can become of value to plants it must be converted into a nitrate. This is constantly being brought about in the manure pile, in the compost heap and in the soil, by certain microscopic plants under proper conditions of warmth and moisture. The decay or fermentation of nitrogenous organic matter (vegetable and animal) is always accompanied by the production of nitrates. It is worthy of note in this connection, that the presence of lime in the soil has been proved to assist in this nitrate production.

Phosphoric acid and potash are the results of disintegration and decomposition of the rock from which the soil was originally derived. By the chemical changes brought about in the soil and by the solvent action of the fluids exuded from plant rootlets, small quantities of these constituents are constantly being converted into soluble forms fit for plant nutrition.

In considering the relative value of a manure therefore, we must take into consideration (1) the amounts or percentages of nitrogen, phosphoric acid and potash contained; (2) the degree of solubility in which these constituents exist; (3) the composition and character of the soil; and (4) the crop to be manured.

FARM-YARD MANURE.

By farm-yard manure is generally understood the mixed dung and urine of horses and cows, together with the litter used in bedding these animals.

Its value primarily and principally depends upon the amounts of nitrogen, phosphoric acid and potash contained in it. It must not, however, be lost sight of that much benefit ensues from the setting free of other inorganic elements used by plants, such as lime and magnesia, and also that the decomposition of the organic

matter of the manure gives rise to carbonic acid, which assists in rendering available plant food locked-up in the soil. These sum up the value of farm-yard manure from a chemical standpoint.

Farm-yard manure, however, plays a very important part in the improvement of tilth, in ameliorating the mechanical condition of a soil. The size of the soil granules, the ability to retain a proper degree of moisture and temperature—all indispensible factors of a fertile soil—are in many instances largely the outcome of judicious manuring.

It is, however, the intention here to consider only the composition of the manure and the various causes which effect its value as a direct supplier of plant food.

The composition of farm-yard manure in the fresh state depends upon:

1. The proportion of horse to cow manure.
2. The proportion of the litter (usually straw) to the excrements.
3. The quantity and quality of the food used.
4. The age and function (milk, wool producing, &c.,) of the animal.
5. The care with which the liquid portion is retained in the manure.

1. That there should be a marked difference in composition between the excrements of carnivorous and herbivorous animals—the former containing more nitrogen than the latter—might naturally be expected; but that the dungs of the various farm animals differ much in quality is a fact not as yet widely recognized.

The following tables show the average composition of the mixed excrements, of the horse, cow, sheep and pig, in the proportions in which they are produced, without litter. These data have been obtained from sources, chiefly Continental. They cannot be regarded as absolute, but while they may be subject to considerable variation, the relative value of one manure to another is maintained.

COMPOSITION of the Mixed Excrements (Boussingault).

	NITROGEN.		PHOSPHORIC ACID.		POTASH.	
	Per cent.	Per ton.	Per cent.	Per ton.	Per cent.	Per ton.
		lbs.		lbs.		lbs.
Horse, mixed excrements	·705	14·1	·25	5·0	·134	2·68
Cow " "	·547	10·9	·08	1·6	·304	6·08
Sheep " "	·71	14·2	·25	5·0	·87	17·4
Pig " "	·37	7·4	·28	5·6	.....	.....

A study of this table will show horse manure and sheep manure to be very similar in the amounts of nitrogen and phosphoric acid they contain, being richer in these elements than those from cows and pigs, with the exception of phosphoric acid in the case of the latter. It is also worthy of note that cow and horse manure supplement one another, the former being rich in potash, the latter in nitrogen and phosphoric acid. Together they form a complete manure, furnishing in good proportions the three essential constituents of plant food.

The following table has been compiled by Heiden, a celebrated German authority. It gives the averages of a very large number of analyses.

Composition of the Mixed Excrements (Heiden.)

	Nitrogen.		Phosphoric Acid.		Potash.	
	Per cent.	Per ton.	Per cent.	Per ton.	Per cent.	Per ton.
		lbs.		lbs.		lbs.
Horse, mixed excrements	·6	12·0	·3	6·0	·5	10·0
Cow " "	·34 to ·44	6·8 to 8·8	·1	2·0	·8	16·0
Sheep " "	·9	18·0	·5	10·0	1·0	20·0
Pig " "	·5 to ·6	10·0 to 12·0	·1	2·0	·5	10·0

From these averages it is also seen that the composition of farm-yard manure is materially affected by the proportion of cow to horse manure it contains.

2. There are many materials used for litter: peat, moss, dried leaves, sawdust and other substances; but since wheat straw is almost universally used, it will suffice here to show how the amount employed affects the composition of the resultant manure.

Composition of Wheat Straw.

	Per cent.	Lbs. per ton.
Nitrogen	·55	11·0
Phosphoric acid	·61	12·2
Potash	·86	17·2

Owing to the power that straw has to resist fermentation, its fertilizing elements cannot be considered as valuable, pound for pound, as those in dung and urine. This refers more particularly to its nitrogen. Some practical farmers consider the manurial value of straw as almost entirely dependent upon its mineral constituents. Straw, however, forms an excellent litter: in its two-fold function it furnishes a clean and warm bed for the animals, while at the same time it absorbs and retains their liquid excrements. Consequent upon its tubular structure, there are few other bedding materials that can equal straw in its ability to absorb liquids.

3. Carefully conducted experiments have demonstrated that the fertilizing elements (nitrogen, phosphoric acid and potash) of a food, save those which are used in the formation of milk, wool or increase of live weight, are voided in the solid or liquid excrements. The amounts so eliminated from the system represent a very large percentage of those present in the food, and this is true even in the case of rapidly growing animals and of those in full milk. The quality of the manure, therefore, is dependent upon the quality of the food. Poor feed makes poor manure; a scanty ration—or one in insufficient quantity—results in a small amount of manure. A fodder rich in fertilizing elements will produce manure more valuable than that obtained from stock fed on a poorer ration. Thus the manure from cattle wintered on straw is worth very much less per ton than that from liberally fed stock.

4. In the preceding paragraph we have seen that a certain small percentage of the fertilizing elements of food is used in the animal system for the manufacture of products, such as milk and wool and for the increase of weight through the formation of animal tissues. This percentage fluctuates with the age and function of the animal. As it varies the percentage eliminated in the dung and urine vary,

for the more the animal takes out of the food, the less there is to go into the manure. Young and growing cattle develop bone and muscle, making large demands upon the nitrogen and mineral constituents of the food. Cows in milk also require like material to produce the daily output. Supplied with food of a like quality, adult cattle, producing no milk and not gaining in weight, yield the richest manure, since in merely maintaining life the fertilizing constituents may be said to be entirely eliminated in the dung and urine.

5. The fact that urine has a much greater manurial value than the solid excreta cannot be too strongly emphasized. The neglect of many of our farmers to thoroughly appreciate this truth is only too apparent.

Our purpose here will be served if we consider the composition of the urine and of the dung from the horse and cow. The following figures may be taken as representing averages, and record the number of pounds of each constituent in one ton.

Constituent.	Horse.		Cow.	
	Urine.	Dung.	Urine.	Dung.
Nitrogen	30·4	11·2	21·0	8·7
Phosphoric acid		7·0		2·4
Potash	18·5	2·0	27·2	·8

If we assign to these constituents the following values: Nitrogen, 17c. lb.; phosphoric acid, 7c. lb.; potash, 5½c. lb.; the above data show that:

One ton horse urine is worth	$6.20
One ton horse dung is worth	2.50
One ton cow urine is worth	5.07
One ton cow dung is worth	1.69

Since the plant food in urine is more readily fermented and available than in the solid excrement, the difference in favour of the liquid manure is really greater than appears by these figures.

It will be well at this juncture to consider the composition of the liquid which drains from the manure heap, since in part at least, it is derived from the urine. It is highly colored, often quite black, strongly alkaline and effervesces vigorously with acids. On analysis, three different samples were shown to contain in 1,000 parts the following:—

	A.	B.	C.
Nitrogen	·511	1·14	1·60
Phosphoric acid	·104	·038	·10
Potash	2·660	1·980	4·90

Since all this plant food is in solution, the great value of this liquid and the economy in preserving it will be apparent.

If the manure heap has been exposed to heavy and constant rains, the composition of its drainage water* may not be equal to those quoted above; on the other hand, there are undoubtedly many instances where the drainage water is still more valuable. Taking these figures as fair averages, we can readily imagine the large amount of plant food lost annually on some farms.

* It will be noticed that this drainage water is very rich in potash—much more so than in nitrogen or phosphoric acid. It has generally been supposed that leaching manure results chiefly in a loss of nitrogen; recent experiments have shown that it is the potash which suffers the greatest loss.

This liquid has an especial value besides the one just cited. It possesses large quantities of carbonate of ammonia and carbonate of potash. These are capable of acting as a solvent upon the nitrogenous and non-nitrogenous solid portions of the manure, setting free for plant use both nitrogen and mineral matter. It is also a favourable medium for the development of those ferments whose function it is to decompose or rot the manure.

Composition of Barnyard Manure.

In connection with some experiments that will be detailed in a subsequent paragraph, the composition of two samples of mixed (horse and cow) manure made on the Central Experimental Farm, was ascertained this year. One sample was taken after fermentation, and the heap had become cold; the other while the fermentation was at its height.

The analyses are as follows:—

Analyses of farm-yard manure, mixed (horse and cow). Central Experimental Farm.

No.	Condition.	Water.	Organic matter.	Ash or Mineral matter.	Nitrogen.
		p.c.	p c.	p.c.	p.c.
1	Well rotted; after fermentation	80·88	14·17	4·95	·515
2	Rotting; during fermentation	79·27	17·38	3·35	·490

Calculating the amount and value of these fertilizing constituents, we obtain the figures in the subjoined table.

Amount and Value of chief fertilizing Constituents in Farm-yard Manure, per ton of 2,000 lbs., Central Experimental Farm.

No.	Nitrogen.		Potash.		Phosphoric acid.		Total value.
	Amount.	Value.	Amount.	Value.	Amount.	Value.	
	Lbs.	$ cts.	Lbs.	$ cts.	Lbs.	$ cts.	$ cts.
1	10·3	1 75	15·9	0 87	8·5	0 60	3 22
2	9·8	1 67	13·6	0 75	6·0	0 42	2 84

For the sake of comparison, I append a number of analyses, the work of several agricultural chemists.

Analyses of manures.

	Pounds per ton.		
	Nitrogen.	Phosphoric acid.	Potash.
Manure, fresh	7·8	3·6	9·0
" rotted	10·0	5·6	10·6
" well rotted	11·6	6·0	10·0
" from Rothamsted	12·8	4·6	6·4
" " Tremblaine	7·2	16·4	.. ..
" " Swiss farms	7·6	4·4	.....

The percentage composition of the mineral matter of those samples of manure (C. E. F.) above referred to, is now given. As, in addition to potash and phosphoric acid, lime, magnesia and iron are all required by plants, this table will be of interest in showing how far these elements are supplied in ordinary manure.

Composition of Ash (Mineral matter) of Farm-yard Manure, Central Experimental Farm.

No.	Insoluble residue.	Lime, Oxide of iron and Alumina.	Magnesia.	Potash.	Phosphoric acid.
1	48·60	17·02	4·05	16·17	8·65
2	44·19	16·29	4·42	20·07	9·03

Loss of Nitrogen, as Ammonia, from Manure.

When stables and cow houses are badly kept or there is a deficiency of litter, ammonia is abundantly developed, and, as it is extremely volatile, much is lost. This ammonia is formed by the fermentation of the urine—carbonate of ammonia being produced at the expense of its urea, the nitrogen-holding compound of urine. While carbonate of ammonia is volatile, it is also extremely soluble in water, and hence it is that the greatest escape of this valuable material occurs when the manure heap is allowed to become dry. In order to rot manure and render available its plant food, this conversion, to a greater or less extent, must take place, and for this, moisture and warmth are requisite. If the heap be kept constantly moistened, preferably with its own drainage fluid (or if necessary with water only) no appreciable loss of ammonia need be feared. Manure must not, on the other hand, be kept in such a soaked condition that the air cannot permeate it, else (as we shall see later on) but little fermentation can ensue. These are the principles to be followed in the economical fermenting of manure.

When well rotted manure is spread on the field, preparatory to being ploughed in, it cannot of course have this care bestowed upon it. Does it then when so lying on the field lose any of its ammonia? To answer this question, the experiments about to be described were made this summer.

Two samples of manure were taken, as before stated; one during fermentation and while the heap was very hot—the other after fermentation had apparently ceased and the heat had subsided. Careful estimations of their nitrogen were at once made. These two samples were then spread in a thin layer on panes of glass and exposed to the sun every day for a month, under shelter from rain. As the layers were comparatively thin, no fermentation took place after the experiment was begun, the manures soon becoming hard and dry. Any loss, then, that might occur would result from the volatilization of ammonia formed in the manure before the experiment. As far as the answer to our question is concerned these conditions are the same as those after the spreading of the manure in the field—since, in the latter case, previous fermentation would be arrested, and fertilizing material washed from the manure by the rain would be received and retained by the soil. Any loss that might occur through volatilization on the field should also take place on the glass plates of our experiment. At the end of the month the amounts of nitrogen in the samples were again taken, with the results set forth in the following table, which also shows the value of the manure in nitrogen before and after the experiment.

NITROGEN in Farm-yard Manure, Central Experimental Farm.

No.	Manure.		Per cent.	Amount per ton in pounds.	Per cent lost on exposure.	Value at 17c. per lb.
						$ cts.
1	Well rotted ; after fermentation.	Before exposure.....	·515	10·3	.....	1 75
		After "	·505	10·1	·01	1 72
2	Rotting ; during fermentation.	Before exposure.....	·490	9·8	.....	1 67
		After "	·466	9·3	·024	1 58

We may therefore safely infer that the loss of ammonia through volatilization on the field is extremely small.

THE APPLICATION OF MANURE.

Whether manure should be applied and ploughed in while fresh rather than in a rotted or semi-rotted condition, must depend upon the character of the soil and the crop to be raised. With light soils that easily exhaust, it is certainly good practice to apply the manure in a semi-rotted condition. Light soils very often are not sufficiently moist to promote active fermentation. Again, they leach easily and therefore it should be the aim to manure for the coming crop, rather than to permanently improve the soil. And lastly, the season of growth on such soils is comparatively short, and therefore the plants should be given their food in an easily soluble condition that they may make the greatest development in the shortest time. Heavy clays and loams, on the other hand, often give better results from fresh than from rotted manure—especially when the saving of labour is taken into consideration. Such soils are retentive of plant food ; they do not allow their fertilizing constituents to easily leach away. The soluble products of fermentation of the manure in the soil form a reserve fund for future crops. Further, such soils often form a suitable medium for fostering fermentation and are themselves improved in their mechanical condition or tilth by the fermentation process and the presence of the litter.

THE CAUSES, CONDITIONS AND RESULTS OF FERMENTATION.

Fermentation in the manure heap is brought about by the agency of microscopic plants known as Bacteria. They require for their development and multiplication, organic matter, warmth and moisture. These bacteria are of two kinds (1) aerobic, or those requiring the oxygen of the air for their existence ; (2) anaerobic, or those which can develop in an atmosphere destitute of oxygen. As the conditions for their development are different, so are the compounds produced by their life functions. The manure at the top of the heap is freely permeated by air. It is here that the aerobic ferments set up a combustion of the material, which is burnt by union with the oxygen of the air in the interstices forming carbonic acid, and much heat in consequence is generated. Lower in the heap, the heat decreases, since there the aerobic ferments cannot live for want of air. The anaerobic ferments that thrive at the bottom of the heap produce but little heat and disengage marsh gas as well as carbonic acid. In the first instance, the soluble carbohydrates of the litter and dung—gum and sugar—are burnt; in the lower part of the heap, the cellulose or fibre is principally decomposed.

Bacteria are present in both the solid and liquid portions of manures, but as it has been already stated, it is more especially in the latter that they find a favourable medium for their growth. Drenching the manure heap with the drainage liquid, therefore, not only affords the necessary moisture to retain the ammonia, but also introduces ferments which act beneficially.

We have hitherto considered the action of the bacterial ferments on the non-nitrogenous compounds of manure. It now remains to be stated that the nitrogen of urine and dung is converted into ammonia and finally into nitrates by their agency. The alkaline solution so produced is able to dissolve unattacked nitrogenous substances both in the litter and dung, and thus prepares for assimilation much plant nourishment otherwise valueless.

SUPERPHOSPHATE OF LIME.

"Superphosphate" is the result of treating bones or mineral phosphate with sulphuric acid. By this process the phosphoric acid hitherto existing in an almost insoluble condition is rendered soluble and immediately available for plants. The value of a sample of superphosphate depends therefore, not only upon the total phosphoric acid it contains, but also upon the proportion soluble in water. "Reverted" phosphoric acid is not so valuable for immediate plant nutrition as the "soluble," though it is much more available than the insoluble form.

The following analyses show the composition of two brands that we have used for experimental purposes and found satisfactory:—

ANALYSES of Superphosphates.

Name of Brand.	Water.	Insoluble rock matter.	Soluble phosphoric acid.	Reverted phos. acid.	Insoluble phos. acid.	Total phos. acid.
"Plain" superphosphate	9·13	6·12	7·72	1·62	3·00	12·34
"No. 1" superphosphate	5·91	11·51	10·78	1·97	3·89	16·64

Grain crops as a rule are benefitted by application of superphosphate, especially in conjunction with manure containing nitrogen. It has also been found exceedingly useful in quantities from 150 to 300 lbs. per acre, as a top dressing for turnips and other root crops.

BONE MEAL.

Bone meal, or finely ground unburnt bones, consists chiefly of phosphate of lime and organic matter—the latter containing much nitrogen.

Commercial samples possess from 17 per cent to 25 per cent of phosphoric acid and from 2 per cent to 4 per cent of nitrogen, according to the purity of the meal.

The following analyses are of two Indian bone meals used on the Central Experimental Farm last season. They purport to have been imported from India—serving as ballast on the voyage. They are both finely ground, a matter of great importance —No. 5 being somewhat the finer of the two.

ANALYSES of Indian Bone Meals.

—	No. 4.	No. 5.
Moisture	7·75	5·90
Organic matter	24·09	19·76
Mineral matter soluble in acid	57·42	51·75
Mineral matter insoluble in acid	10·74	22·59
	100·00	100·00
Phosphoric acid	22·05	18·07
Nitrogen	3·29	2·42

Assigning the values for phosphoric acid and nitrogen fixed by the Inland Revenue Department for these ingredients in bone meal, we obtain the following:—

—	No. 4 per ton.	No. 5 per ton.
	$ cts.	$ cts.
Phosphoric acid at 6c. per lb.	26 46	21 68
Nitrogen at 14c. per lb.	9 21	6 77
	35 67	28 45

In the presence of moisture and warmth, bone meal is decomposed in the soil, the nitrogen and phosphoric acid becoming converted into assimilable forms for plant food. This fermentation goes on best in fairly open soils and proceeds but slowly in heavy clays, which exclude the air necessary for the process.

As bone meal possesses no potash (an essential element of plant food), wood ashes or some other potash fertilizer may be mixed with the meal before application. Excellent results are obtained by this method.

Superphosphate gives more immediate returns than bone meal, owing to the fact that the greater part of its phosphoric acid is soluble in water; the effects of an application of bone meal are, however, more lasting.

For turnips and other root crops, bone-meal is considered a valuable top-dressing; for wheat, however, and short-seasoned crops, superphosphate is usually preferred.

BONE-CHAR SCREENINGS

If bones are burnt with access to air, white Bone-ash results; when, however, they are heated out of contact with air (as in an iron retort) certain volatile substances are given off and bone-black, known also as Bone-char or bone charcoal, remains behind. This bone-char consists of bone ash (phosphate of lime, principally) and carbon or charcoal—the latter being from the incomplete combustion, of the organic matter of the bones. The nitrogen of the organic matter is given off (as ammonia, principally) during the heating of the bones.

Bone-char, owing to its porous character and decolourizing power, is largely employed in sugar refineries. After it has been used for clarifying the solution of brown sugar, it is known as "spent" bone-black, and is sold as a source of phosphoric acid for use in agriculture. Fresh bone-char, from its method of production, contains little or no nitrogen "Spent" bone-char however may possess comparatively large quantities of this element. If blood is used in the sugar refinery, the nitrogen in the char will vary from 5 per cent to 15 per cent; if blood is not used, it is much lower, the nitrogen being obtained only from the organic impurities of the sugar. From 5 per cent to 1 per cent in the latter case is usually present.

The following sample of bone-char screenings was forwarded by Mr. E. C. Cole, of Moncton, N.B., and was obtained from the Moncton Sugar Refining Company. It is the screening from the char used for filtering purposes, and was sold at $20 per ton. "Spent" char is also sold by the same firm at about the same price.

Analysis of Bone-char Screenings.

Moisture	1·10
Organic and volatile matter	12·32
Mineral matter soluble in acid	84·40
Mineral matter insoluble in acid	2·18
	100·00
Phosphoric acid	33·78
Nitrogen	·414

Allowing 3 cents per lb. for phosphoric acid, and 8 cents per lb. for nitrogen, this material is worth $20.96 per ton.

The phosphoric acid in bone-char is scarcely equal in value for agricultural purposes to that in bone-meal, since there is no nitrogenized organic matter to set up fermentation in the soil, and thus render it available.

FISH MANURE.

The refuse accumulating at fish canning factories, packing-houses and ports from which fish are shipped, is known as fish scrap, fish waste, or fish manure. Nitrogen and phosphoric acid are its chief constituents of value. Though necessarily of variable composition, fish refuse may always be considered a strong and forcing manure, fermenting easily, and readily yielding its fertilizing elements to the growing crop.

The sample here reported upon was made at Digby, N.S., seven or eight years ago. It was forwarded for analysis by P. Innes, Esq., Kentville, N.S.

Analysis of Fish Manure.

Moisture	29·40
Organic and volatile matter	20·28
Mineral matter soluble in acid	49·01
Mineral matter insoluble in acid	1·31
	100·00
Nitrogen	2·39
Phosphoric acid	4·70

Valuing the nitrogen at 12 cents per lb., and the phosphoric acid at 6 cents per lb., one ton of the above is worth $11.37.

It may be applied as a top dressing, or lightly harrowed in. It should prove especially valuable for grain crops and grass. Used in conjunction with wood-ashes (or other form of potash) an efficacious fertilizer for all clases of farm crops would result. Decay and partial decompositon renders the plant food in this material more readily available.

When the soil is light and easily leached, it is not economical to apply soluble and concentrated manures in large quantities at once. A better practice is to apply them in small amounts and often, and if possible to the growing crop.

COD FISH BONE.

This waste product was forwarded by Gen. J. W. Laurie from Cape Negro, N.S., with a request for a report as to its value for manuring purposes. Regarding its occurrence, he writes: "I was struck with the large quantity of cod fish bones lying on the beach where our fishermen dress their fish. These bones are stripped of all flesh by the flies and bleached by the sun and weather." The sample received and analysed was a large back-bone, clean, white and dry. It was quite brittle and was easily pounded to a tolerably fine condition. This was then put through a mill to further reduce it. Its composition is as follows:—

Analysis of Cod Fish Bone.

	Per cent.
Moisture	5·79
Organic matter	37·48
Mineral matter soluble in acid	55·13
Mineral matter insoluble in acid	1·60
	100·00
Phosphoric acid	22·41
Nitrogen	5·18

In the raw and untreated condition the finely ground fish-bone, according to the above analysis, may be valued as follows:—

	Per ton.
Phosphoric acid, 448·2 lbs., at 5½ cts	$24 65
Nitrogen, 103·6 lbs., at 12 cts	12 43
Total	$37 08

These figures may be taken as representing a trade valuation; the exact agricultural value is dependent upon many factors, such as condition of soil, the climate, the crop to be raised and so on.

Its application without previous treatment, save being ground to a fine condition, would be followed, undoubtedly, by an increased crop yield, since by the action of soil-fermentation the nitrogen and phosphoric acid would slowly be rendered soluble. If, however, it is wished to obtain its beneficial effects the first season, the fish-bone should be fermented in the compost heap or treated with sulphuric acid. The former method is much to be preferred, as the use of the strong acid is dangerous in the hands of the inexperienced. The most suitable materials for composting the fish-bone are good farm-yard manure, or a mixture of lime and wood-ashes. The heap may be covered with muck or good earth, and kept moist. By this treatment the bones are broken down and in the course of a few months a concentrated and valuable manure results.

MARL.

Eight samples of this natural fertilizer, analyzed during the past year, are here reported upon. Four were from Ontario, three from Quebec and one from Nova Scotia.

An inspection of the subjoined table will show that great variation in composition, and hence in value, exists between them.

Analyses of Marls, 1892.

No.	Locality.	Sender.	Water.	Organic matter.	Insoluble residue.	Oxide of iron and Alumina.	Carbonate of lime.	Phosphoric acid.	Nitrogen.	Remarks.
1	Ste. Adelaide de Pabos, Que...	Rev. J. Dechamplain....	·42	3·60	2·76	1·84	88·36	None	.....	An excellent specimen.
2	" "	"	8·77	24·27	11·00	2·00	52·83	"	·907	Contains 25 per cent organic matter, with nearly 1 per cent nitrogen.
3	Lot 12, Junction Gore, Gloucester Township, Ont	Alf. Brown.	·52	4·20	72·81	7·83	15·44	"	.....	A poor sample, insoluble matter too high.
4	Ste. Geneviève, Que.....	J. A. Chauret.....	1·04	7·12	·94	·21	90·06	"	.....	A very good sample.
5	Kinmount, Ont.	Henry Coben..... .	1·68	10·55	·75	·39	87·11	"	.....	"
6	Woodville, Ont.	Wm. Grant....	16·23	12·72	3·60	1·10	66·53	"	..... .	Of good average quality.
7	Hants County, N.S..... . .	S. J. Jenkins.....	10 16	22·87	19·55	3·35	42·15	Traces	·670	Contains also organic matter.
8	Wellington, Ont.....	W. P. Niles	66·02	5·53	1·36	.....	.....	"	.....	Possesses large percentage of water, otherwise pure.

The chief agricultural value of marl lies in the fact that it supplies lime to the soil. Carbonate of lime—the form in which it exists in marl—is not caustic and cannot therefore injure vegetation nor destroy organic matter in the soil, as an over application of freshly burnt lime is apt to do. Carbonate of lime is dissolved by the carbonic acid of rain water and becomes plant food. It also acts beneficially in freeing other constituents, rendering them available. It is principally of service, however, in favouring the development of those micro-organisms of the soil which convert nitrogenous material into soluble nitrates—the condition or form of nitrogen which plants can use and convert into their tissues. So much so is this the case that soils otherwise rich do not yield maximum crops if lime is wanting or deficient in quantity. Fertile soils always contain lime. Experience corroborates science in the value of the application of lime or marl to soils rich in humus.

The well-known and beneficial action of lime and marl on plastic clays, as well as on peat and sandy soils, has been treated of at length in former reports.

SOOT.

This material has long been in use in Europe as a top-dressing for pasture and the cereals—more especially wheat. As such it bears an excellent reputation. Its chief fertilizing value lies in the amount of nitrogen it contains, though it also possesses (as a rule) small quantities of potash and phosphoric acid. The greater part of the nitrogen exists as salts of ammonia, a soluble and valuable plant food. Soot is somewhat variable in its per cent of nitrogen, and samples obtained under different circumstances have often widely different values. The causes for this are numerous. Pure soot is not easily procured; it is generally mixed to a greater or less extent with ashes or earth. Its richness in nitrogen is dependent not only on the kind of fuel (coal, wood, &c.) burnt, but also on the manner in which such is burnt. A slow fire, a weak draft and a good condensing chimney are conducive to a soot rich in nitrogen; while a bright fire, a strong draft and a short chimney will give only a small quantity of soot of poor quality.

A sample forwarded by Mr. E. McArdle, St. Catharines, Ont., was found on analysis to have the following composition:—

Analysis of Soot.

Moisture	2·50
Organic and volatile matter	53·66
Mineral matter soluble in acid	10·32
Mineral matter insoluble in acid	33·52
	100·00
Nitrogen	1·04
Potash	·22
Phosphoric acid	Heavy traces

Besides its role as a fertilizer, it is said by many gardeners to act beneficially in preventing the attacks of insect pests.

As a top-dressing, it may be applied at the rate of 25 to 50 bushels per acre to the young crop.

Assigning the following values:—Nitrogen, 17 c. per lb.; potash, 6 c. per lb.; the soot examined is worth $3.90 per ton.

PART III.

MISCELLANEOUS EXPERIMENTS AND ANALYSES.

THE BABCOCK METHOD FOR ESTIMATING BUTTER-FAT IN MILK.

That the *chief* value of milk, whether for consumption, the creamery or the cheese factory, lies in the amount of butter-fat it contains, is a fact that has become during the past few years more and more widely recognized.

Following naturally upon the acceptance of this fact there has arisen the endeavour, on the part of both the purchaser and vendor, to adopt the method of valuing milk according to its richness in fat. All interested in the great milk industries are realizing that quality as well as quantity must be taken into consideration if the sale of milk is to be put upon an equitable and business-like basis. As a means towards that end it is necessary that there should be forthcoming a reliable and easily-worked process for determining the percentage of fat in milk. Such a process we have in the "Babcock test." In Bulletin 12 of the dairy series, issued last year, we established by chemical proof the accuracy and reliability of this method, showing that while it is one that can be worked in the dairy and cheese factory, its results are such that all confidence may be placed in them as a basis for the valuation of the milk examined.

The chief drawback against the general adoption of this test in dairies has been the fact that it involved a considerable expenditure of time, since every patron's milk had to be examined daily. An alternative was offered in the use of corrosive sublimate or potash, which, being added to the milk, preserved it from decomposition. Such use allows a composite sample to be obtained, which can be examined by the Babcock method at the end of the week. There are several objections to the use of these preservatives, chief among which is the danger of using in a dairy such poisonous chemicals. The percentage of fat found in the composite sample multiplied into the total pounds of milk supplied by the patron during the week and divided by 100, gives the number of pounds of butter-fat.

An effort has been made in our laboratories to so modify the test that, while the use of chemicals and the second sampling of the milk are avoided, the examination of the milk of each patron need only be made weekly. Our efforts in this direction have been successful. It is found that when one-sixth ($\frac{1}{6}$) of the amount of milk recommended in the Babcock method is taken—the successive sixths for a week being run into the same test bottle—the same percentage of fat is obtained as by averaging the percentages of fat found by testing the milk daily. We have abundance of chemical proof to support this statement, but the insertion here of the data of three series of experiments will suffice.

SIX DAYS' Composite tests by the Babcock Method.

First series.			Second series.			Third series.		
—	Quantity of Milk.	Per cent of Fat.	—	Quantity of Milk.	Per cent of Fat.	—	Quantity of Milk.	Per cent of Fat.
	c. c.			c. c.			c. c.	
Monday	17·6	3·4	Monday	17·6	3·5	Monday	17·6	5·1
"	17·6	3·3	"	17·6	3·6	"	17·6	5·0
Tuesday	17·6	3·7	Tuesday	17·6	3·3	Tuesday	17·6	5·4
"	17·6	3·6	"	17·6	3·2	"	17·6	5·4
Wednesday	17·6	7·3	Wednesday	17·6	5·4	Wednesday	17·6	3·4
"	17·6	7·2	"	17 6	5·4	"	17·6	3·4
Thursday	17·6	2·9	Thursday	17·6	4·7	Thursday	17·6	3·7
"	17·6	3·0	"	17·6	4·7	"	17·6	3·6
Friday	17·6	9·1	Friday	17·6	3·4	Friday	17·6	4·9
"	17·6	9·2	"	17·6	3·4	"	17·6	4·9
Saturday	17·6	3·0	Saturday	17·6	4·6	Saturday	17·6	3·6
"	17·6	3·0	"	17·6	4·6	"	17·6	3·6
Average of above		4·9	Average of above		4·15	Average of above		4·33
Monday to Saturday inclusive, composite test	2·93	4·8	Monday to Saturday inclusive, composite test	2·93	4·2	Monday to Saturday inclusive, composite test	2·93	4·4
	2·93	4·9		2·93	4·2		2·93	4·4

It is thus apparent that by the use of a pipette which delivers ($\frac{1}{6}$) one-sixth of the amount ordinarily employed, namely, 2·93 c.c., the testing may be done once a week. The above figures show that this very large economy in time and labour is not accompanied by any sacrifice in accuracy. A large number of composite tests have lately been made, and sufficient data have accumulated to prove that the curdling and souring of the milk in the test bottle, which usually takes place on the third day, does not affect the accuracy of the test.

BICHROMATE METHOD.

Since the above work was finished, there has appeared in "Biedermann's Central Blatt für Agriculturchemie" an article by J. A. Alén, a chemist of Gothenburg, Sweden, upon the preservation of milk by means of potassium bichromate. This salt, when present only in small quantities, will prevent milk from coagulation for many weeks. The total solids and fat may be estimated in the preserved sample with accuracy. This opened up a new field for investigation in connection with the testing of composite samples. With the assistance of Mr. C. F. Whitley, of the Dairy Commissioner's staff, I have been enabled to test this method and to report as follows upon its efficiency: From 3 grains to 7 grains of this chemical are put in the bottle to hold the daily samples.* Into the bottle (there must be one for each patron) is run daily a small quantity of the milk supplied. Before the daily addition of the milk, that already in the bottle is gently shaken up, so that the risen cream may again be thoroughly mixed throughout the sample. At the end of the week the ordinary pipette full (17·6 c.c.) may be withdrawn and the fat estimated by the usual Babcock method. The sample bottle should be kept in a cool place, but there is no necessity to place it on ice. This method has given most satisfactory results, as the following table will show:—

*From our work here I find that the amount of bichromate used may vary within comparatively wide limits without the efficacy of the test being interfered with. I should advise purchasing the chemical in the powdered condition, then ascertaining the measure in a small spoon of say 10 grains. The bichromate may then be measured into the bottles instead of weighed, and thus a saving of much time effected.

PERCENTAGE OF FAT.

Composite Sample (6 days).	Bichromate and Babcock Test.	Average of Daily Analyses by Gravimetric Method.
Sample A.....	3·70	3·625
" B.....	3·55	3·505
" C.....	4·85	4·830

The above represents the results of three weeks trial, but subsequent work has confirmed the great accuracy here depicted.

The treated milk is perfectly fluid at the end of five weeks, and allows of a perfect sample being then taken.

Potassium bichromate is a red crystalline salt, easily soluble in water and milk. It imparts a deep orange red colour to the sample, so that there is no mistaking the latter for pure milk. It thus has a decided advantage over corrosive sublimate or potash, which do not colour the milk. It is poisonous, but not in so marked a degree as the substances just mentioned. In the quantities used (3 to 7 grains), it cannot be said to present any danger.

Commercial potassium bichromate is quoted at 14 cents per lb. This is sufficient for about 1,000 composite samples. By its use the testing of the milk is only necessary once a week, thereby saving a large expenditure of time and labour over the method now in vogue.

In working this method, I would advise the taking of the milk sample from the weigh can by means of a tube, open at both ends, of about one-eighth of an inch in diameter. The tube is placed in the can, the upper end closed with the finger and withdrawn. The contained milk is then allowed to run into the patron's sample bottle. In this way not only is a thoroughly representative sample obtained, but a proportionate amount of the milk daily supplied by each patron is secured. This is consequently more accurate than when an equal quantity is taken daily, as the results obtained give exactly the pounds of fat in the week's milk of each patron.

EXPERIMENTS ON THE PREVENTION OF SMUT IN WHEAT.

This is now the third year of experiment, the results of previous work having appeared in former annual reports. Very briefly, our conclusions up to 1892 were (1) that, while iron sulphate (1 lb. to 8 gall.) in no way injured the vitality of the wheat germ, it was useless in destroying smut spores; and (2) that copper sulphate (1 lb. to 8 galls.) was efficaceous in killing the smut, though when the solution was allowed to remain in contact with the seed for a long time, the vitality of the wheat was affected, the extent of the injury depending on the period of treatment. It was further stated that the small amount of loss in vitality was not to be compared with the advantage of having wheat free from smut, which follows the use of bluestone.

The experiments of the past year consisted in ascertaining the effect of different treatments (1) on the vitality of the germ and (2) on the prevention of smut.

The solutions used were all of the same strength: 1 lb. to 8 gallons.

In the case of the "agricultural bluestone" and copper sulphate, duplicate quantities of seed after treatment were dipped in lime water. It was hoped that by this means the injurious action of the salt of copper on the germ would be neutralized, while its effect as a fungicide would not be impaired. In all these trials the seed was immersed and thoroughly stirred for five minutes in the solutions under experiment.

The following table shows the effect of the different treatments upon the wheat germ :—

Effect of Smut Preventives on the Vitality of Wheat, 1892.

Variety of Wheat. 200 grains.	Treatment.	Sown.	23rd March.	24th March.	25th March.	26th March.	28th March.	1st April.	Total.	Per-centage of vitality.	Per-centage of strong plants.	Per-centage of weak plants.
Red Fife	Untreated	1892	163	176	179	182	183	183	183	91·5	84·5	7·
"	Iron sulphate	1892	95	154	162	167	171	172	172	86·	77·	9·
"	Agricultural bluestone	1892	95	156	175	180	188	192	192	96·	84·5	11·5
"	" and lime water	1892	168	190	192	192	194	194	194	97	92·	5·
"	Copper sulphate	1892	58	93	126	137	147	159	159	79·5	67·	12·5
"	" and lime water	1892	89	130	151	169	178	178	178	89·	81·	8·
Saxonka	Untreated	1892	159	183	190	191	192	192	192	96·	90·	6·
"	Iron sulphate	1892	136	174	184	185	189	190	190	95·	88·	7·
"	Agricultural bluestone	1892	81	121	147	155	173	177	177	88·5	76·	12·5
"	" and lime water	1892	154	179	188	189	191	194	194	97·	88·	9·
"	Copper sulphate	1892	45	87	108	127	155	169	169	84·5	66·	18·5
"	" and lime water	1892	103	143	170	180	184	187	187	93·5	84·	9·5
Red Fife	Untreated	1892	140	166	176	176	180	184	184	92·	82·	10·
"	Iron sulphate	1892	76	155	171	189	189	189	189	94·5	77·5	17·
"	Agricultural bluestone	1892	48	121	151	162	176	180	180	90·	69·	21·
"	" and lime water	1892	111	155	170	178	180	184	184	92·	76·	16·
"	Copper sulphate	1892	28	60	85	107	134	153	153	76·5	55·5	21·
"	" and lime water	1892	72	108	134	149	163	167	167	83·5	65·5	18·

From these data it will be observed (1) That the copper sulphate used alone or with iron sulphate (as in agricultural bluestone) lowers the percentage of vitality, corroborating previous results; (2) That the subsequent immersion in lime water of wheat treated with copper solutions lessens the injurious effect of the copper salts, not only in reducing the number of plants destroyed, but also in increasing the percentage of strong plants; (3) That the iron sulphate, as in previous experiments, as a rule does not affect the vitality of the wheat.

These treated wheats were then sent to Mr. Bedford and Mr. Mackay at the Experimental Farms at Brandon and Indian Head. Plots 10 feet by 10 feet were sown with them at the rate of $1\frac{1}{4}$ bushels to the acre. At the time of harvesting, the number of smutty heads and of good heads in each plot were counted.

On account of causes not under direct control, considerable irregularity marks the results. They, however, show :—

1. That sulphate of iron is not efficacious in destroying smut spores.
2. That sulphate of copper treatment is the most efficacious of all in preventing the development of smut.
3. That "Agricultural Bluestone" occupies, usually, a position between these two salts in reducing the amount of smut.
4. That the subsequent immersion in lime water of seed treated with copper sulphate and "Agricultural Bluestone," lessens the effect of these salts as smut preventives.

From these experiments and those of previous years, I conclude that copper sulphate solution is by far the most efficacious for killing the smut spores, and that it is doubtful, taking all things into consideration, whether the subsequent immersion in lime water is advisable.

WELL WATERS.

The work of analysing samples of well waters from farmers' homesteads has been continued, and seventeen waters are here reported upon. From the remarks in the last column of the table it will be noticed that in the large majority of instances the waters were seriously polluted and dangerous for use.

ANALYSES OF WELL WATERS, 1892.

Results Stated in Parts Per Million.

Number.	Name.	Locality.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 100° C.	Solids after ignition.	Loss on ignition.	Oxygen absorbed at 80° F. In 15 min.	Oxygen absorbed at 80° F. In 4 hrs.	Phosphates.	Report.
1	Caron, S..	Lachenaie, Que.....	April 16	1·94	·14	.....	620·0	1,582·0	1,504·0	78·0	.....	.....	Traces....	A very dangerous water to use.
2	Carpenter, F. M....	Stoney Creek, Ont..	July 5	None	·10	7·428	275·0	1,416·0	1,166·0	250·0	·472	1·028	h. traces...	Probably contaminated.
3	Anderson, S.....	Harbord, Ont.....	" 6	·01	·295	2·93	13·0	410·0	290·0	120·0	2·556	5·188	.. ...	Not a good water. Too much vegetable matter.
4	Patterson, Wm.....	Almonte, Ont.....	" 11	·08	·12	2·141	22·5	426·0	290·0	136·0	·6736	1·0892	h. traces...	A very suspicious water.
5	St. Louis Dam.....	Rideau Canal, Ont..	" 11	·10	·435	None	·5	192·0	98·0	94·0	5·2676	9·5052	h. traces...	Very bad water.
6	Anderson, S..	Harbord, Ont. . .	" 11	·14	·07	.....	6·0	.....	.....	.....	·9012	2·000	... .	Condemned for drinking purposes.
7	Michaelis, Gustav...	Balgonie, N.W.T....	Aug. 2	..	....	.....	70·0	4,328·0	3,460·0	868·0	... ..	.....	.....	Unfit for use. Large amount of epsom salts.
8	McCuaig, Duncan...	Drumconnor, Man..	" 6	·005	·065	6 05	18·5	342·0	320·0	40·0	.....	.....	Traces....	Second-class water.
9	Popham, Stewart....	Brandon, Man	" 19	·09	·125	·468	3·5	374·0	264·0	110·0	·908	1·864	.....	Unsafe for drinking purposes.
10	Cummings, Wm....	Hallville, Ont.....	Sept. 15	·02	·11	7·62	86·0	797·0	542·0	255·0	.... .	.....	.....	Shows contamination. Dangerous to use.
11	Ross, H. C.....	Cummings' Br., Ont.	" 15	·03	·175	·041	·8	326·0	262·0	64·0	1·188	2·344	....	No sewage pollution.
12	Hunt, Richard	Summerside, P.E.I.	" 10	·004	·198	4·71	24·0	216·0	114·0	102·0	·060	·132	Traces....	Not first-class. Too much organic matter.
13	Hunt, Richard ...	" "	" 10	·05	·032	3·13	32·0	238·0	150·0	88·0	·492	·906	" ...	A "fair" water.
14	Hunt, Richard	" "	" 10	·056	·12	6·10	96·0	548·0	450·0	98·0	·548	1·132	" ...	Suspicious and probably dangerous.
15	McGregor, Wm.....	Windsor, Ont. .. .	Oct. 6	·03	·135	·041	2·5	115·2	95·2	20·0	·240	5·80	" ...	Not first-class.
16	McGregor, Wm.....	"	" 6	·032	·090	·0527	2·4	136·0	114·0	22·0	·232	·580	" ...	"
17	McGregor, Wm....	"	Nov. 15	·14	·145	·054	2·8	126·0	100·8	25·2	·428	·804	h. traces..	Not a safe water. Sewage pollution indicated.

I am led to believe that more attention is now being paid to the purity of the water supply on farms than heretofore, but it still seems necessary to emphasize the danger that exists in drinking (or using for cattle) water contaminated with sewage.

The practice of digging the well where it may act as a cesspool to the stable, barnyard or privy is most reprehensible, and, I am sorry to say, has not yet been discontinued in some parts. In light, sandy soils the distance that such drainage will travel has been proved to be much greater than is ordinarily supposed.

That continued sickness in a family, and more especially typhoid fever, diarrhœa and diseases of an allied character, is often due to water receiving excremental filth I have been repeatedly able to show.

The necessary instructions for taking and shipping samples of water for analysis are sent to farmers on application.

EXPERIMENTS TO ASCERTAIN THE VALUE OF DILUTE SULPHURIC ACID FOR CHECKING THE SPROUTING OF POTATOES.

The quality of potatoes for culinary use is seriously affected in spring by sprouting. Despite great care, this often takes place, materially deteriorating the value for table use of large quantities of potatoes annually.

A statement has been widely circulated of late in the press of Canada setting forth a so called successful treatment for the prevention of this sprouting. This treatment consists in immersing the potatoes in a two per cent (2 per cent) solution of sulphuric acid (oil of vitriol)for some time, and then rinsing with cold water. This, it is claimed, will effectually prevent the "eyes" from sending forth shoots.

In order to ascertain the validity of this statement, a series of experiments was inaugurated in the spring of the present year, with the following results:—

Experiment 1, February 25th, 1892. Variety of potato, Early Ohio. The potatoes showed no signs of immediate sprouting and were in good condition. They were immersed in a solution of sulphuric acid of the recorded strength, in which they were allowed to remain 17 hours. The potatoes were then rinsed with cold water, spread out to dry and put in large, wide-mouthed glass bottles.

Result.—On standing, the potatoes became covered with pink spots, or patches, which after a few days shrivelled. Decomposition soon set in at these places. After about two weeks a few of the eyes began to sprout. On cutting the potatoes, litmus paper showed that the acid had thoroughly permeated the tuber. The appearance of the potatoes was entirely destroyed for market purposes.

Variety.—Chicago Market. Treated as above throughout.

Result.—The potatoes were more shrivelled than the Early Ohio. Many of the eyes were deeply pitted and decomposed, yet one or two, apparently unaffected, sprouted after two weeks. Examination showed that the acid had completely permeated the tissue of the potato. The potatoes were not fit for use.

Experiment 2.—Variety, State of Maine. Immersed for four hours in the acid solution. Subsequent treatment was identical with that in the former experiment.

Result.—Potatoes became slightly pitted with pink spots. Sprouting greatly retarded, but beginning after nine days.

Experiment 3. Variety, Beauty of Hebron. Immersed for two hours. Subsequent treatment, the same as before.

Result.—Potatoes showed a few pink spots upon drying, Sprouting evidently retarded, but beginning after one week.

Experiment 4.—Variety, Empire State. Immersed for one hour. Subsequent treatment, the same as before.

Result.—Potatoes but very slightly affected by the acid; sprouted readily.

Experiment 5.—Variety, Thorburn. Immersed for twenty minutes. Subsequent treatment, the same as before.

Result.—Potatoes were not apparently affected by the acid; sprouted readily.

Summarizing these results we find that immersion for 17 hours did not kill all the eyes, though the potatoes as a whole were much affected by the acid, destroying them entirely for table use. Immersion for 4 hours injured the potatoes somewhat, but sprouting, though retarded, finally set in. Treatment for 2 hours but slightly affected the appearanee of the potatoes, but was valueless in preventing sprouting. Shorter periods of treatment did not injure the potatoes, but the acid was then not efficaeious in killing the eyes. Sprouting took plaee after 20 minutes immersion as readily as in untreated tubers.

Conclusion. Under the conditions stated above, there can be no doubt that 2 per cent sulphuric acid is valueless in preventing the sprouting of potatoes.

In these experiments no effort was made to preserve the treated potatoes from the light; future trials will be made in order to ascertain to what extent light is instrumental in promoting the sprouting of treated potatoes. It is also proposed to treat the potatoes in the autumn instead of in the spring, as it is possible that the eyes would then be more easily killed.

MERCURIC CHLORIDE (CORROSIVE SUBLIMATE) AS A FUNGICIDE.

Some months ago the editor of the "Canadian Horticulturist" forwarded to the Central Experimental Farm, Ottawa, a letter from one of his correspondents who asked of what value this chemical was as an insecticide and fungicide? We had had no experience with it, nor could any literature on the subject be found. With a view, therefore, of obtaining an answer to the question, a series of experiments was inaugurated, the results of which are here given. These experiments have neeessarily been of a preliminary character, but they have given some interesting results and serve to indieate the direction for future work.

One of the essential characteristics of a successful fungicide or insecticide is that it shall not be injurious to the foliage to which it is applied. The first step therefore was to investigate the effect of solutions of corrosive sublimate of different strengths on the foliage of certain plants and trees.

Mercuric chloride is a white, crystalline salt, soluble in about fourteen (14) times its weight of cold water. In its physiological action it is "corrosive, irritant and highly poisonous." These properties would lead us to suppose that solutions approaching saturation would be highly injurious to foliage as well as destructive to insect life. It is an antiseptic of great value, and its well known power in preserving animal tissues from the growth of moulds and bacteria would suggest it as a useful agent in destroying or preventing the development of parasitic fungi.

Solutions of two strengths were made and experimented with.

A.—1 part of corrosive sublimate to 1,000 parts of water by weight ($2\frac{1}{2}$ drm. to 1 gall.)

B.—1 part of eorrosive sublimate to 2,000 parts of water by weight ($1\frac{1}{4}$ drm. to 1 gall.)

First Series of Experiments:—

The following plants were seleeted, Hydrangea, Abutilon, Coleus, Geranium and Fuehsia, whieh at the time of experiment were in the green-house. An atomizer, which made the solution as fine as mist, was employed for the spraying.

Hydrangea.—Sprayed with solution A. Shortly after drying it was noticed that both leaves and flowers were becoming brown. The sprayed parts soon shrivelled and died, presenting in the course of a few days a burnt or scorched appearance.

Solution B was then tried. On drying from the first application, no injury was apparent. The plant was then sprayed a second time—the foliage in the interim not having been watered. Patehes of small brown spots now appeared on the leaves a short time after drying. The life of the sprayed leaf was not however visibly affected.

Abutilon.—Sprayed with solution A. Small brown patches appeared after second spraying, but the vitality of the leaves appeared to be unimpaired.

With solution B. No injury could be detected until about one week after second spraying (ten days after first application), when a few brown, film-like spots appeared; otherwise the leaves were healthy and vigorous.

Coleus.—Sprayed with solution A. The leaves soon showed signs of scorching, the injury extending to the destruction of the cell substance. Death of the treated leaves and their falling off soon followed.

With solution B. The leaf was injured by the first application, though not seriously. After the second spraying, at an interval of three days, the injurious effect of the corrosive sublimate was more apparent. Sprayed parts finally died.

Geranium.—With solution A. Almost immediately on drying the foliage became brown, as if the leaves had been badly scorched. The leaf shrivelled, died and dropped in the course of a week.

With solution B. Very little injury appeared at first, but after the second application the injury was most marked. The sprayed foliage eventually died and dropped.

Fuchsia.—Sprayed with solution A. Very slight injury, if any, could be detected—even after several sprayings.

With solution B. The leaves appeared perfectly healthy and normal after repeated applications.

Second Series of Experiments :—

The effect of the trial solutions was then ascertained on the foliage of certain fruit trees, as follows: Apple, pear, plum and cherry. These were all young trees, from four to six feet high, and were in nursery rows. They were all sprayed twice with both solutions (A and B), an interval of three days intervening. No injury to the foliage resulted in any case.

As an Insecticide :—

As the thin film of poison would lie on the surface of the leaves, we should expect it to be most efficacious in the case of those insects that eat away the substance of the leaf. To those, like the plant lice, that pierce the epidermis and suck the juice it could only act as an irritant (perhaps to the extent of destroying) at the time of spraying. A colony of mealy-bugs was sprayed several times, but only succumbed after prolonged treatment.

No experiments have as yet been made to test the efficacy of corrosive sublimate directly as a fungicide, a suitable opportunity not having offered itself.

Conclusions. With the limited data at our command it is not advisable to speak too definitely as to the future usefulness of this compound as an insecticide and fungicide. Some inferences, however, may, I think, safely be drawn. The foliage of different plants evidently varies widely in ability to withstand the corrosive action of this compound. A solution which is very injurious to one plant is often quite harmless to another. The green-house plants, with one exception, were all affected by solution B (though some, not disastrously so), while the fruit tree foliage was uninjured.

From the properties of this salt (corrosive sublimate) and the result of our work, I am, however, not hopeful for its success as an insecticide. I do not think it can safely be applied in solutions sufficiently strong to act in this rôle.

I am more sanguine for its usefulness as a fungicide, and future experiments may show that solutions even more dilute than "B" may be used to advantage in checking or destroying fungus life.

REPORT OF THE ENTOMOLOGIST AND BOTANIST.

(James Fletcher, F.R.S.C., F.L.S.)

W. Saunders, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to hand you herewith a report upon some of the more important subjects which have been brought under my notice officially during the past season. The only new insect pest of importance which requires special mention here is the Cattle Horn fly (*Hæmatobia serrata*, R. Desv.), upon which under your instructions I prepared a bulletin (C. E. F. No. 14) in September last. This has been distributed to our correspondents both in English and French, and I trust that the farmers of Canada will recognize the great importance of using every effort to stamp out this small but formidable foe. Enquiries concerning insects, for the most part this year, have been with regard to enemies of field and fruit crops. In the division of Botany, some interesting experiments have been carried out as to the best means of preventing loss from the disease known as Potato-rot. The collection in the Botanic Garden has been increased by about fifty species, chiefly willows, poplars, oaks and birches. A border for perennials has also been begun, and clumps of about forty of our native Michaelmas-daisies, golden-rods and other plants have been established. Large numbers of specimens have, as usual, been sent in for identification, both of insects and plants.

Field Crops.—Cereal crops have on the whole been somewhat freer from insect attacks than usual. The Hessian Fly and the Wheat-stem Maggot were sent in from a few localities. In the Ottawa district the former was sought for carefully, but in vain. Last year, through the kindness of Professors Riley and Forbes, I was favoured with a consignment of Hessian Fly "flax seeds" infested by a parasite which has done good service in Europe by reducing the numbers of this often undetected foe. These arrived in good condition, and were liberated at Ottawa in a field known to be infested. Although no specimens could be found of the parasite or its host, I am still hopeful that the parasite may have established itself, and that the benefit of the experiment may become evident later. The strange injury to oats by the common Red-legged Locust (*Melanoplus femur-rubrum*, De G.), which has been frequently noted, in which the flowers and grains are cut off from the panicles and dropped to the ground, has been again reported by the Hon. G. W. Allan, from his farm near Barrie, Ont. Grain crops were somewhat injured in eastern Ontario by the Devastating Cut-worm (*Hadena devastatrix*, Brace). Corn was less attacked, as far as I have received reports, than for many years previously. The only cut-worm that was sent in frequently was the Red-backed Cut-worm [*Agrotis* (*Carneades*) *ochrogaster*, Guen]. I was able to clear up part of the life history of this species during the past season. Eggs laid by a female caught in the field during October, 1891, hatched only on April the 20th following. These were full grown, and pupated June 10th, the first moths appeared July 20th. This is a large caterpillar, exceeding $1\frac{1}{2}$ inches in length when full grown, and attacks almost all succulent vegetation.

The Pea-weevil has been unusually destructive, and were it not that there was a larger acreage than usual put in to this crop, there would have been a considerable shortage in Ontario. Bean plants in most districts were severely injured by Anthracnose [*Colletotrichium Lindemuthianum* (Saccardo and Magnus) Brios. and Cava.], and experiments were carried out by Mr. Craig on the beans grown in the horticultural

department, with a view of discovering a remedy. These will be found in his report on page 104.

Root maggots of cabbages, onions, radishes and turnips have been, perhaps, the most troublesome pests of the year. For garden application Hellebore tea and Kerosene Emulsion applied at the roots have been successful, but for field practice no adequate remedy has so far been discovered.

The Colorado Potato-beetle (*Doryphora 10-lineata*, Say) made its appearance as a serious pest of potatoes in Nova Scotia and Prince Edward Island. Paris Green is undoubtedly the best remedy for this enemy, and, when it is used with proper care, no danger of poisoning need be apprehended. It is poisonous, of course, very poisonous; but so are many other substances which it is necessary to use. No possible ill results to human beings can follow its use upon plants, from their absorbing its poisonous principles into their tissues. A predaceous bug (*Podisus cynicus*, Say), which was found feeding upon the Colorado Potato-beetle, by Mr. A. J. McNeill, of Little Sands, P.E.I., was also sent to me by correspondents at London, Toronto and Ottawa.

Turnips were comparatively little injured by the Flea-beetle; but late in September the Turnip Aphis (*Aphis rapæ*, Curtis) made its appearance in a few localities in alarming numbers; specimens were received from Prince Edward Island, Quebec and Eastern Ontario. Turnips on the Central Experimental Farm were brought to me on the 4th of November, which had been heavily infested, but the pests had been entirely destroyed by the fungus *Empusa aphidis*, Hoffm., the whitened and swollen dead bodies being in conspicuous masses at the bases of the leaves.

The Zebra caterpillar of *Mamestra picta*, Harr., was very numerous in the vicinity of Ottawa. It appears to be literally omnivorous, attacking plants of all orders. It was very destructive to young spruces, asparagus and peas, cabbages, clovers, etc., and was sent in several times as an enemy of potatoes. Late in the season, as recorded further on, the eggs were largely destroyed by parasites.

The Celery caterpillar, *Papilio Asterias*, Fabr., was sent in from various places in Ontario and Quebec, where it was destructively abundant upon celery, carrots and parsnips. Of those bred, most of the specimens were found to be parasitised by the Ichneumon fly *Trogus exesorius*, Brullé.

A caterpillar which occurred in undue numbers all through the eastern portions of the Dominion was the so-called "Salt-marsh Caterpillar" (*Leucarctia acræa*, Dru.) This insect is widely distributed and occurs all over Canada. The caterpillars, known as "Woolly Bears," feed upon most low plants, and are occasionally, when abundant, injurious in gardens to beans, lettuce, cabbage, etc.; but their favourite food plants seem to be useless weeds, such as lamb's quarters, dandelion, etc. A consignment of caterpillars sent to me by Mr. C. H. Wright, of Middleton, Ont., was found to be infested with the infectious fungous disease *Empusa grylli*, Fres., var. *aulicæ*. Experiments made with the object of propagating this disease apparently failed.

Fodder Crops.—Hay and all fodder crops were excellent in most of the provinces, the spring having been exceptionally favourable. Grass insects received some attention. The injury known as "silver top" was remarkably prevalent, and is due to several insects, principally, I think, as suggested by Prof. Osborn, to small leaf-hoppers, perhaps also to a Thrips, and also in the stems of some of the larger grasses to the Wheat-stem Maggot. In the experimental grass plots, the larva of *Hydræcia cataphracta*, Grote, the Tomato-stem Borer, was very abundant in the young stems of *Phalaris arundinacea* and *Elymus Canadensis*. The same caterpillar was also more than usually destructive, burrowing in the stems of many herbaceous plants, such as tomatoes, potatoes, lilies, sunflowers, &c. There was doubtless much unrecognized injury to grass lands from the attacks of the Devastating Cut-worm and the American Frit-fly underground, and a true Thrips upon the leaves. A severe attack upon marsh grass lands by an insect which has never before, in my experience, been noticeably, injurious, was that of *Ctenucha Virginica*, Charp., which was reported to me by Mr. Amos Vernon, of Minudie, N.S. The caterpillars are interesting, from their very different colouration during the last moult, when they are

yellowish white, and the preceding ones, when they are black and white, with yellow ornamentation.

Fruit Crops.—There has been as usual much inquiry with regard to the common pests of the orchard and garden, such as the Tent Caterpillars, the Oyster-shell Bark-louse, the Red-humped Caterpillar of the Apple, the Woolly Aphis, the Grape-vine Leaf-hopper, and the Cherry-slug.

The Eye-spotted Bud-moth did not occur nearly so widely nor so abundantly as last season. The Cigar Case-bearer, mentioned in my report for 1891, at page 196, has been named by Prof. Fernald, of Amherst, Mass., *Coleophora Fletcherella*. This insect which was first sent some years ago from Prince Edward Island and New Brunswick, appeared in enormous numbers in 1891 in the orchard of Dr. D. Young, at Adolphustown, Ont. Dr. Young has carried out careful spraying experiments both with hot and cold Kerosene Emulsions and different strengths of Paris Green He has found this a difficult pest to eradicate, but has succeeded best with the Kerosene Emulsion used in spring when the caterpillars are active. An outbreak of the Apple Bucculatrix at St. Catharines, Ont., was kindly brought to my notice by Mr. W. J. Hambly, of the Toronto *Mail*, and specimens of twigs from infested trees, which have been sent to me, without any letter, show that the insect occurred in very great numbers. From specimens received, coming from widely separated districts, I fear that the Pear-leaf Blister is spreading. The almost invisible elongated white mites which cause the blisters on the leaves, pass the winter in the scales of the buds of pear trees. The best remedy is to spray infested trees, just as the buds are opening, with Kerosene Emulsion.

A new attack of some interest upon apple buds and blossoms is reported from Nova Scotia by Col. Wm. M. Blair, Superintendent of the Experimental Farm, at Nappan, N.S. This is by the click-beetle, *Corymbites caricinus*, Germ. I have, on two occasions previously, received these beetles from Nova Scotia as occurring upon apple blossoms, but with no statement as to their injuries. Col. Blair, however, writes to me on the 1st of June: "I send you herewith some beetles which are destroying the foliage of our trees. They are on every tree in hundreds and seem to suck the leaves as soon as they appear. They fall to the ground at the slightest shake. When the flowers open, they attack those also, and many other plants and shrubs, in fact, they are on almost everything that has a leaf." Prompt spraying with Paris Green was recommended and the collection of the beetles by beating the foliage over a beating-net or an inverted umbrella.

The enemies of the grape-vine were abundant in western Ontario, but their attacks were most noticeable upon the Virginian Creeper (*Ampelopsis quinquefolia*). The caterpillars of the Beautiful Wood-nymph and the Lesser Grape-vine Sphinx in many places, stripped this ornamental creeper of its foliage; both, however, were much reduced in number by parasites.

The Raspberry-cane Girdler (*Oberea bimaculata*, Oliv.) was the chief enemy of the raspberry in the Ottawa district, and specimens of its work came in from other parts of Ontario and Quebec.

Paria sex-notata was again this year a most serious pest of raspberries at St. Catharines, Ont. Mr. Martin Burrell writes: "My old enemy *P. sex-notata* has revisited me this spring in greater numbers than ever. I sprayed with Paris Green, 4 ounces to 40 gallons, but the foe still 'bobbed up serenely.' Of a quarter of an acre of my raspberries not a score of canes have leafed out. I am not the only victim this year, as several of my neighbours have been seriously injured by the beetles." This insect, like the Rose-beetle (*Macrodactylus subspinosus*, Fabr.), appears to be very difficult to treat, even Paris Green having much less effect than much milder poisons with other insects. It is the perfect insects which destroy the young growth at the time of flowering. The grub passes its life under ground, living upon roots.

Red and white currants, where neglected, have been defoliated by the Imported Currant Saw-fly. Paris Green early in the season and White Hellebore after the fruit has formed are safe and effective remedies. Fruit infested by the Currant Weevil (*Anthonomus rubidus*, Lec.) was sent by Mr. W. S. Duggan, from Murray Bay, Que.,

where it had reduced largely his crop of red currants. This weevil can generally be found every year at Ottawa in small numbers but nearly always in white currants. All infested fruit ripens before the main crop and should be destroyed before it drops from the branches.

Forest Trees.—The most noticeable attack of the year to forest trees was by the Fall Web-worm (*Hyphantria cunea*, Dru.) and where the webs were not removed upon their first appearance in August, at which time it would have been an easy matter, the disgusting webs filled with excrement, remain as unsightly witnesses of negligence. *Lophyrus abietis*. Harr, the Spruce Saw-fly, attacked Norway spruces in Winnipeg and western Ontario. It was also injuriously abundant upon native spruces in the Muskoka district. The Larch Saw-fly, *Nematus Erichsonii*. Hart., continues its ravages in the tamarack swamps of Ontario, Quebec and the Maritime Provinces. Already thousands of acres of native larch have been killed. Two other imported saw-flies are now being studied at Ottawa, where they have developed during the last four years as serious pests. *Fenusa varipes*, St. Farg. (*melanopoda*, Cam.) and *Nematus pallidiventris*, Fallen. The former of these is a small black saw-fly, $\frac{1}{8}$ of an inch in length or a little more, which inserts its eggs beneath the epidermis of the upper surface of the young leaves of the European alder. The larvæ mine within the leaves and give them a very blotched and withered appearance. When full-grown, they eat their way out and fall to the ground, beneath the surface of which they pass the pupal stage. There are two and perhaps three broods in the season. So far no parasites have been detected. Owing to their habit of feeding within the leaves a practical remedy is difficult to devise. *Nematus pallidiventris* is a species found in Northern Europe and was probably introduced with willows from Russia. In all its stages it somewhat resembles the Imported Currant Saw-fly and is easily checked by spraying with Paris Green.

Weeds.—There has been much correspondence on this important subject, of which I treated at some length in my last report. The most serious imported agricultural pest is a member of the Mustard family, *Sisymbrium sinapistrum*, the "Tumbling Weed" of the settlers around Indian Head, N.W.T. This is a large coarse annual or biennial, according to locality. In Europe, where it is native, it is, according to D. Rapin, an annual in the valley of the Rhône, and, according to Dr. M. Seubert, a biennial in the valley of the Rhine. The same difference exists in Canada; a plant observed on a railway bank at Ottawa passed the winter and threw up its flowering spike in June. In the North-west, however, it is a true annual. Mr. Mackay writes: "It starts in the spring from seed, and if let alone, will ripen its seed at the same time as mustard, or about wheat harvest. If cut off above the ground, it will throw out shoots, which, if let alone, will ripen seed before frost comes, if the first cutting is early enough. If not, the shoots will go on growing until the first frost destroys it. It does not start in the spring from the autumn growth, as you suggest, for that is entirely dead. One seed produces one stock which lives and dies the same season." The normal size of this plant in Europe is about two feet high, but a large specimen sent to me entire by Mr. Mackay for the purpose of counting the seeds was more than twice that height, with numerous branches covered with long pods. All of these were counted: each pod contained an average of 120 seeds in two ranks and gave the enormous total of one and a half millions of seeds from the one plant. These when threshed out weighed 150 grammes (nearly $5\frac{1}{2}$ ounces.) The seeds are very small, about half the size of the seed of timothy, and dark reddish brown in colour. There is no doubt but the introduction of this pernicious weed into the North-west Territories is a most serious matter, and it is gratifying to know that farmers there are paying so much attention to this subject and using every effort to stamp out noxious weeds. The large number of specimens which have been sent to me for identification by farmers, weed inspectors and others, are proof of this.

Of plants which have developed locally as aggressive weeds, in addition to the above, the following may be mentioned, and tend to show that almost any plant under special circumstances may become a troublesome pest: *Camelina sativa*, *Neslia paniculata*, *Iva xanthiifolia*, *Iva axillaris*, and *Corydalis aurea* in Manitoba;

Cuscuta trifolii, from Ashcroft, B.C., and from western Ontario, *Hieracium aurantiacum*, extending from the Eastern Townships into Vermont, and *Lepidium campestre*, from Stoney Creek, Ont.

The subject of "Loco" weeds has been brought forward by the poisoning of sheep and lambs in Manitoba, but no specimens were forwarded, and nothing definite was ascertained. It would be well if the owners of sheep runs would send specimens of any plants belonging to the Pea family with upright (not creeping) stems which they may find on the runs, when sheep have been poisoned.

Meetings.—I have during the year attended five Farmers' Institute meetings, at Cowansville, Que., Brantford, Picton, Carp and Galetta, Ont. At the request of the Hon. Minister of Agriculture and Arts of Ontario, I attended a meeting of a committee of the Provincial Legislature, and gave evidence as to the best time to spray fruit trees to destroy insect pests, without running the risk of poisoning bees, which are of so much importance to fruit-growers in fertilizing blossoms, as also of course in making honey.

Acknowledgments.—I beg again to express my thanks to many who have rendered me valuable assistance in making observations and sending me prompt notice of the occurrence of injurious insects and fungous pests. I wish particularly to acknowledge my indebtedness to Prof. C. V. Riley, Dr. George Vasey, and Mr. B. T. Galloway, of Washington, and Prof. John Macoun, of Ottawa, for many favours in the identification of specimens and for the loan of illustrations; also to Dr. J. Hamilton, of Allegheny, Pa., for the identification of coleoptera, and Prof. Byron D. Halsted, of New Brunswick, N.J., of fungi.

Donations have been received from the following:—
Prof. John Macoun, seeds of native plants.
T. N. Willing, Calgary, N.W.T., seeds of native plants.
W. E. Saunders, London, Ont., specimens of native plants.
W. Scott, Ottawa, specimens of native plants.
J. Dearness, London, Ont., specimens of native plants.
Dr. J. E. White, Toronto, collection of roots of native plants.
J. R. Anderson, Victoria, B.C., collection of roots of native plants.
Prof. W. J. Beal. Agricultural College, Mich., grass seeds.
J. S. Pearce & Co., London, Ont., grass seeds.
Sutton & Sons, Reading, England, grass seeds.
Vilmorin, Andrieux & Co., Paris, France, clover seeds.
Hon. C. F. Cornwall, Ashcroft, B.C., roots of *Lewisia rediviva.*
J. B. Olcott, South Manchester, Conn., fine sod of *Festuca*, Olcott No. 1.
W. H. Holland, Norquay, Man., root of *Physalis grandiflora.*
Pro. H. Garman, Lexington, Ky., seed of Kentucky grown *Poa pratensis.*
R. E. Purver, Riverside, B.C., specimens of insects.

On April 11, Mr. J. A. Guignard, B.A. and B.L., B. Sc. of the University of France, was appointed Assistant Entomologist and Botanist, and with his valuable assistance, I am gradually clearing off the large amount of back work which had accumulated during the past four years. Mr. Guignard's knowledge of European languages, added to his scientific attainments, has rendered his appointment one of much value in the successful conduct of my department.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

DIVISION OF ENTOMOLOGY.

THE HOP-VINE BORER, "THE COLLAR-WORM OF THE HOP."

(*Hydræcia immanis*, Guen.)

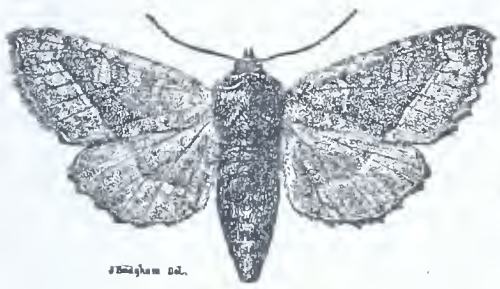


Fig. 13. The Hop-vine Borer. *Hydræcia immanis.*

Attack.—Small slender caterpillars, about ½ inch in length, marked with chocolate brown bands of large irregular spots on a whitish ground, separated by a narrow white dorsal, a double lateral and an infrastigmatal clear white line. Head white, thoracic shield, anal shield and the legs dark brown. These are found burrowing in the leading shoots of hops early in June. Later, the same caterpillars are found just beneath the surface of the ground, attacking the bases of the annual stems at the collar, where they spring from the root stock. The larvæ are, when full-grown, large fat caterpillars, 1¼ to 1¾ inches in length, of a dirty white colour, with reddish-brown heads and having the body spotted with black bristle-bearing tubercles. The dark bands which were conspicuous in the young larvæ are now almost obliterated and quite so in some specimens.

In June, 1889, my attention was drawn to this insect by Mr. Wellington Boulter of Picton, Ont.; and from several hop growers, I learnt that the ravages in some sections of Prince Edward County were considerable every year. Since that time and with the assistance of Mr. S. J. Cotter, Secretary-treasurer of the Dominion Hop-Growers' Association, I have worked out the life history of this pest.

The first notice I find in literature of the Hop-vine Borer is by Dr. Bethune, in the Report of the Entomological Society of Ontario for 1872, page 33, where a detailed description is given of some larvæ which were found injuring hops by gnawing the stems at the crown. Canadian entomologists have from time to time tried to identify that insect. I have now no doubt that the larvæ described were of *H. immanis*. In the *Canadian Entomologist*, vol. XIV, 1882, p. 93, is an interesting article by C. R. Dodge, entitled "The Hop-vine Borer," in which the author describes correctly the habits of the larvæ and gives much valuable information with regard to the injuries committed by them. Mr. Dodge does not give the name, but unhesitatingly pronounces it to be identical with those described by Dr. Bethune. Dr. Lintner in his Second Report, 1885, p. 41, says of this insect: "Our first knowledge of its true character was that obtained from Prof. J. H. Comstock, who at the annual meeting of the Entomological Society of Ontario, held at Montreal during the meeting of the American Association for the Advancement of Science, in August 1882, exhibited several examples of the insect, which he had succeeded in breeding from the 'Hop-grub.' We know of no publication by Prof. Comstock of his study of this insect."

In Bulletin 4, Division of Entomology, Prof. J. B. Smith, published an extensive report of some observations made by him in New York State, under the direction of the Entomological Division of the United States Department of Agriculture.

Prof. Lintner in his article above referred to, which appeared in 1885, reproduces the salient points of previous records, and also adds some further notes of interest.

The ravages of this insect have been long known to hop growers in New York and New Jersey States, as well as the main features of its life history.

It is, however, by no means a common insect in Canada. The moth occurs rarely at Ottawa, and I have specimens from Toronto and London, Ont. The larvæ are described by Dr. Bethune as occurring in large numbers at Erindale, Credit, Ont. In Prince Edward County, where the cultivation of the hop has become an important industry, this enemy has been allowed to increase so much that it is now a serious drawback to the lucrative cultivation of the hop.

"*August 4th.*—I enclose you some objects which I find down in the ground in my hop hills. What are they, and what will they bring forth? The grubs in my hop-yard are very numerous, and doing a great deal of damage. Please give any information you can."—JAMES CRAWFORD, *Bethel, Ont.*

The objects sent by Mr. Crawford were the chrysalides of *H. immanis*, from which I bred some moths, and one specimen of *Ichneumon jucundus*, Brullé.

Life-history.—The eggs are greenish white, rounded above, flattened beneath, finely striate from the apex to the base. They are laid singly on the young shoots of the hop as soon as they appear above the ground. The growth of the shoots is very rapid at this time of the year, and they are about 3 feet high before the work of the young caterpillars is noticed.

The young caterpillars are very slender, pale in colour, with dark longitudinal lines, and dotted with black bristle-bearing tubercles. They at once eat their way into the vine and stop its growth, causing what are known as "bull-heads," among the hop growers of Prince Edward County, but "muffle-heads" in New York State, according to Prof. Smith. The cause of these bull-heads is, the central shoot being destroyed, growth is checked for a time, but two shoots are produced from the joint next below the injury. When the caterpillar is about half an inch in length it eats its way out of the shoot and lets itself down to the ground, and Prof. Smith states, "entering the stem at the surface of the soil feeds upwards, interrupting the growth of the vine and lessening its vitality. The larva now changes colour, and becomes dirty white with a strong deep reddish tint, apparently proceeding from beneath the surface of the skin, and with numerous black spots. As the vine grows, it becomes hollow and hardens, and the more rapidly as the free flow of sap is interrupted. The larva, now about an inch in length, and still slender, burrows downward to the base of the vine at its junction with the old stock, and eating its way out completes its growth as a subterranean worker. It is in this state that it is best and most widely known as the hop 'grub,' and the ravages caused by it are the most noted." (U. S. Div. of Ent., Bul. 4, p. 35.)

According to Mr. Cotter's observations, the young caterpillars for the most part, leave the tips of the vines before the end of May, but occasional specimens may be found in the tips, even to the middle of June. They become full grown by the first week in August, so that for two months these larvæ are a constant drain on the vitality of infested plants. The injury to the stems by the large caterpillars is apparently, in comparison with their size, small. A wound is eaten into the side of the stem; the caterpillar lies in the ground close to this, and must, I judge, subsist almost entirely upon the sap. When full fed it assumes the chrysalis form in the ground close to the roots of the hop plants. This is from 1 to $1\frac{1}{4}$ inches in length, dark brown in colour, elongated and heavy in shape, with a double spine at the blunt posterior end. It remains in the chrysalis condition from five to seven weeks, and the moths are found on the wing during September and October. They pass the winter in a torpid state, probably beneath leaves and rubbish. Several specimens kept alive in a breeding cage remained constantly on the bottom and took advantage of any small object to hide beneath it. The moth itself, although very inconspicuous when on the ground or among leaves, is a beautiful creature when examined closely, from the contrast of the shades of colour and the velvety appearance of the central area of the wings. The moth measures $1\frac{1}{2}$ to $2\frac{1}{4}$ inches across the expanded wings. The general colour is a rosy brown, which is paler at the extremities of the wings; the central portion is much darker, being shaded with dark velvety bronze, and is marked with two large pale spots known as the orbicular and reniform. The fore wings are divided into three areas by narrow, oblique, transverse lines, edged exteriorly with pale pink. The hind wings are paler in colour, crossed in the middle by a slightly darker line. The sexes are similarly marked, but can be distinguished by the larger abdomen of the female and a conspicuous fan-shaped brush at the extremity of the abdomen of the male.

This moth has been placed in the three different genera, *Gortyna*, *Apamea* and *Hydræcia*, by different writers. Prof. Riley writes me lately: "As regards *immanis*,

I think that we should follow Prof. Smith's new catalogue in retaining it in *Hydræcia*. I have always referred it to this genus." In view of this opinion, I have therefore used that generic name. This question is discussed at some length by Prof. Lintner in his First Report, page 115.

Remedies.—It will probably be found that the most effective remedy is the collecting by hand and destroying the young grubs before they leave the tips of the vines. An attacked shoot has a characteristic appearance which is recognized at sight by an experienced eye. When thinning and tying the vines such can be easily removed and the young caterpillar destroyed by crushing it. In Prince Edward county this must be done before the last week in May, and as the vines have to be trimmed and the shoots chosen for tying to the poles about that time, very little extra labour will be entailed.

Mr. Dodge, in his article above referred to, says as follows:—"Next to the crushing process, a useful remedy is to hill the hops as soon as possible and give the yard a thorough cultivation. The hilling causes fibrous roots to put out above the operations of the grub and save to some extent the crop." On the other hand, he speaks most highly of a method recommended by a New York grower of hoeing away the earth from the vines about the first of June, applying fertilizers to the roots and not hilling up till the end of July. Prof. Smith recommends this same treatment of exposing the roots, but says that five or six days, early in June, will be a sufficiently long time. The idea of baring the roots is to render them harder and more unattractive to the caterpillars, while hilling them up is to induce a free growth of secondary rootlets to repair injury and strengthen the vines.

I hope to induce some of our Canadian hop-growers to try careful experiments with different methods of treatment next year. At a meeting of the Dominion Hop-growers' Association, which I attended at Picton, Ont., in May last, I learnt that a kind of herring which is thrown up in large quantities on the lake shore, had been used as a fertilizer for hops, and that where this had been done the Collar-worm was far less abundant. On this point Mr. Cotter writes to me, Dec. 22nd:—"With regard to fish as manure for hops and to prevent attacks of the Collar-worm, Mr. Mathew Benson, ex-president of our association, tried it, and he believes it is a success. I have also tried ashes, and believe, as Mr. Benson does, that they are good—ashes in the fall, fish in the spring. I would state that my crop has never been so heavy since 1885 as it was this year, but great discretion had to be exercised in applying the manures best adapted for the different soils. My advice would be: Ashes for sand and fish for heavy soils, to fight the Collar-worm and not get too much growth of vine."

"Dec. 26.—A bull-head may be made into a good runner, if required, by nipping off one shoot at the crotch. Some growers have tried fish against the Collar-worm, and they say it works well, but I have had no experience with them. Wood ashes applied in the fall before manuring are very good."—James Crawford, *Bethel, Ont.*

I am of the opinion that the virtue of the fish as a preventive of Collar-worm attack is due chiefly to the offensive odour of the putrefying fish at the time the young caterpillars fall to the ground to attack the root. The ashes probably act only as a fertilizer, and would not have much value as a deterrent

Mr. Dodge and subsequent writers on the Hop-vine Borer draw attention to the good services of skunks in destroying the caterpillars. Mr. Dodge says: "All growers speak most favourably of the friendly offices of these much despised animals in the hop-yard. They seem to have acquired the digging up process to perfection —far better than the hop-grower—as they are able to dig around the hills without the least injury to the vines. In Juneau County, Wisconsin, this little fellow—with an appetite for juicy grubs only equalled in degree by the pungency of his perfume —is the only positive remedy, as he works about the hop-hills or roots, cleaning out the worms in a few nights. One grower says: 'I have seen ten acres where not a dozen hills would escape their little noses.'

"It is worthy of note that in a majority of cases the growers report the borer as the most injurious insect in the hop-yard, not excepting the hop-aphis."

THE RED TURNIP-BEETLE.

(*Entomoscelis adonidis*, Fab.)

Attack.—A showy scarlet beetle with three black stripes down its back, a black patch on the collar and black legs; two-thirds the size of the Colorado Potato-beetle, but narrower in outline, eating the leaves both as larva and perfect beetle of turnips, radishes, and cabbages.

During the past season, I have received further reports concerning the injuries of the Red Turnip-beetle to turnips and other plants of the cress family in Manitoba and the North-west Territories, and I again draw attention to it, as I am convinced that unless it is watched carefully, it may, with the increased cultivation of crops suitable as its food, develop into a serious agricultural pest, in the same way as was the case with the Colorado Potato-beetle, when potatoes were grown in large quantities in the districts which were its native home. In response to a request made in my last annual report, I have received eggs and living specimens, male and female, from several correspondents and have thus been enabled to examine the larvæ hatched from some of these eggs, and observe them through all their stages.

The depredations do not appear to have been so severe this season in some of the districts where they were most serious last year.

"*August* 9.—We have very few of the Red Turnip-beetles this year."—Rev. F. R. Hole, *Minnedosa, Man.*

"*August* 29.—The beetles are not so numerous as last year. They have only worked on radishes, but I think they are going to multiply, although no eggs have been laid yet."—Joseph A. Smith, *Saskatoon. N.W.T.*

"*September* 1.—I send you by mail to-day a few Red Turnip-beetles, which have appeared on my white turnips. I have a few rows of white turnips in three different parts, within an area of four acres, and on each of the plots the beetles are to be found. Some Swede turnips are growing between two of the rows of white, but I do not find any of the beetles on these, nor upon some mangels growing alongside the turnips. The beetles seem to be the most troublesome on the driest land, and where the turnips are smallest. This would appear to be their breeding season, as many of them are in pairs."—William Lindsay, *Elkhorn, Man.*

"*September* 20.—In reading your report for 1891, I was specially interested in the account of the Red Turnip-beetle which has this year completely ruined my crop of Swede turnips. My experience with them is quite different from that of the majority of your correspondents, as my radishes which were growing only ten or twelve yards from the turnips were almost untouched; also a few rough leaved white turnips which were growing amongst the Swedes were scarcely touched. Last year I did not see one on the place. I herewith enclose what I presume are the eggs of the beetle; these I found after diligent search very lightly covered with soil. The eggs are deposited in masses slightly stuck together, but a very light shake seems to separate them. I have never seen any grubs on the turnip leaves. Is it possible that they remain under ground? Two or three days ago I noticed a gravid female crawl under a sod. I marked the spot, and this morning uncovered her; she was dead, and scattered around her were a number of eggs. In one spot there was a cluster as described above."—C. E. F. Lowe, *Yorkton, N.W.T.*

"*September* 27.—I have discovered the eggs of *Entomoscelis adonidis*, I think, by thousands. I first found them on the surface of the ground under some dried up radishes (thinnings of the crop), which had been thrown aside. Following up the clue thus given, I found them under almost any slight covering, and sometimes only under a shade which did not amount to an actual covering. I also found them a quarter of an inch or so under the surface of the ground by the roots of rough-leaved turnips and radishes. I think the eggs were not placed there, so that the young larvæ might be near suitable food on hatching, but that they are laid almost promiscuously under any slight cover or shelter. Where the beetles are plentiful the eggs are so also in proportion, and where the beetles are scattered widely apart as among grass or stubble the eggs are not found; but this is only, I believe, because the search is more difficult. The eggs are laid wherever the beetles happen to be

during the month of September and some of the females doubtless lay much earlier."—THOS. COPLAND, *Saskatoon, N.W.T.*

The above facts with regard to the egg-laying habits of this insect in a state of nature were precisely the same as I myself observed with several pairs kept in confinement for over a month upon growing turnips. Enormous numbers of the small reddish brown eggs were laid from time to time by the females, in loose masses of from 5 or 6 to 80. These were generally tucked beneath any small object on the surface of the ground or occasionally into the folds of a dead leaf on the ground. The usual habit, however, in nature is probably that the eggs are laid in clusters beneath sods or in cracks or other openings in the soil. Eggs laid in September were kept in my office quite dry until November, when they were slightly dampened, and on the second day afterwards the small larvæ appeared. This was probably due to the artificial heat of the office. In nature the eggs would not have hatched until next spring. The larvæ have fed readily upon all kinds of cruciferous plants offered to them. When first hatched garden cress was the only plant available and they took to it at once. Some seedlings of rape and the small shoots from the crowns of Swede turnips then formed their food until some radishes sown on the day the eggs hatched, were sufficiently advanced to feed them. This was for about a fortnight, since which they have been fed entirely upon radish leaves, and they seem to be perfectly healthy. They are very shy and drop from the leaves at the slightest disturbance, and this, I think, must be the reason why they have been overlooked by my correspondents.

The insect takes its scientific name *adonidis* from one of its food plants in Europe, *Adonis autumnalis*, a plant belonging to the *Ranunculaceæ*. It is, therefore, possible that it may feed naturally in the North-west upon some of the many plants of that order or upon wild *Cruciferæ*, and thus have escaped notice in the larval stage. The eggs hatch early in spring and most cultivated cruciferous crops as turnips and cabbages are not planted until long after the young larvæ would have starved on cleanly cultivated land. On wild plants the larvæ would, of course, easily escape the notice of ordinary observers, and the presence of the insect would only be recognized when the perfect beetles flew to the fields from their breeding places and began destroying the crop. When once seen the larvæ will be easily recognized by the uniform dull black colour. It is also very advisable that farmers in Manitoba and the North-west Territories should know what it looks like, as soon as possible, so as to watch it carefully and keep it in check. The same insect occurs in Europe where it has occasionally shown its powers of doing injury. Prof. Riley has kindly referred me to the literature of this subject from which it appears that the larva was reported in Hungary in 1865 as having been very injurious to rape. In a description of the larva written for the "Annales de la Société Entomologique de France," 1890, II. pp. 177-179 by P. Lesne, it is reported as injuring the same crop in Roumania as follows: "The eggs, of the form and colour of the seed of Cameline * (gold of pleasure) but smaller, are laid in autumn. The larvæ appear the following spring, soon after the last frosts, when the winter colza (rape) is beginning to germinate, that is to say, the latter half of March. Larvæ and adults are very injurious to colza in Roumania, and in certain years whole crops are destroyed by them. Unfortunately it is very difficult to fight this species, especially in countries where at the least 100 hectares (247 acres) are given to the culture of rape. Droughts favour its multiplication, while cold and rainy weather greatly retard it."

Remedy.—As soon as the beetles appear upon turnips or radishes, the foliage should be sprinkled with Paris Green and water, 1 lb. to 100 gallons. From the fact that the eggs are laid in largest numbers on land where a crop has been attacked, of course, a similar crop should not be grown there the following season. If the black elongated larvæ are found abundantly on wild plants, these should be sprayed freely with Paris Green and water.

The Egg.—When first laid, orange red in colour, turning darker gradually until it is dark brown, elongated, oblong, sometimes slightly curved, 1·30 mm. long by

* *Camelina sativa.* False Flax.

·60 mm. wide. Surface minutely granular roughened; under the microscope, closely reticulated or mottled with small white circular marks in the centre of each of which are from 1 to 7 dark brown dots of the same colour as the intervals between the circles. These circular marks are not quite close enough together to give them a polygonal appearance; they vary in size, the largest being about three times as big as the smallest. The eggs are laid in clusters loosely agglutinated together and deposited beneath clods or in crevices of the soil.

The Larva.—When just hatched, orange with black spots turning black in 24 hours, wedge-shaped, 2 mm. long, (2·55 mm. when extended); head black, ·75 mm. wide, slightly wider than the anterior segments. Each segment bears 2 dorsal transversal rows of black tubercles, from 6 to 8 in each row and each one bearing a long slender bristle, which expands into a small knob at the apex. Thoracic shield, large, covering the whole upper surface of segment 2, and bearing about 20 bristles. Just above the stigmatal line, on each of segments 3, 4 and 5, is one large dark bristle-bearing tubercle; below the stigmatal line on each side is one series of large tubercles; one on each segment, each of which bears 2 or 3 bristles. There are also 2 ventral series of rather smaller tubercles. From 9th segment, the body tapers rapidly to the end. Antennæ conspicuous, protruding beyond the cheeks.

After first moult, length 3·25 mm. (4 mm. when extended); body slug-shaped, flattened beneath, full and rounded above, not decidedly narrow at the collar as in the Colorado Potato-beetle, abruptly truncate in front, tapering behind to the prehensile bilobed anal joint. Head, sub-rotund, transverse, slightly depressed at apex. The whole body velvety black, of a reddish brown shade in some specimens, particularly beneath the spiracles, covered with transverse rows of elongated piliferous tubercles, three rows to each segment, composed respectively of 8, 6 and 6 tubercles in the first, second and third rows. Each segment is divided transversally into two folds, the anterior bearing the first two rows of tubercles and the posterior the third row. The tubercles of the second and third rows are much larger than those of the first. All the tubercles, the head, and the thoracic and anal shields, are shining black and covered closely with short blunt fuscous bristles, each tubercle bearing many bristles. Thoracic feet and spiracles, black. Underside, dull greenish black. Thoracic shield, large, covering the whole upper surface of segment 2, deeply impressed and roughened on each side. Below the spiracles is an infrastigmatal series of very large conical tubercles, and beneath this again a supraventral series, half the size of the above. On the ventral surface are five series of tubercles, the central series occurring on every segment. There is a narrow slightly depressed dorsal groove running from the apex of the head the whole length of the body, distinct and pale where it crosses the thoracic shield and the third and fourth segments.

After second moult, length 5 mm. (7 mm. when extended); ornamentation and colour, the same as in previous stage.

Mature larva, length about 12 mm. The body and appendages as described above.

After the second moult, the colour gradually changed as the larvæ matured. The ground colour above the spiracles retained its velvety appearance, but on the underside the skin seemed thinner and more translucent, the orange juices of the body showing through it and giving a dull orange hue to that portion. This was much more apparent in some specimens than in others. One or two pale specimens were distinctly bi-coloured, black above and yellow beneath; but the general appearance of the mature larva should be described as an elongated narrow grub, black above, yellowish beneath, and half an inch in length by one-eighth of an inch in width. In confinement the larvæ fed both day and night. They were comparatively active, but dropped from the food plant at a slight disturbance. Beneath segments 9, 10 and 11, counting the head as the first segment, are three pairs of small bag-like translucent extensile pseudopodia or false feet. These are used as prolegs, and appear to be extended at will from median slits in the ventral surface. In walking, these organs and the anal bilobed process are distended with the fluids of the body and seem to be of equal value in progression with the thoracic feet.

The Pupa :—length, 6 mm. by 3½ at widest part; bright orange. The wing, leg and antenna cases, honey yellow; head, folded down on the breast. Wing cases, bearing each three longitudinal striæ. Spiracles, round and fuscous. Dorsal vessel, conspicuous as a dark stripe. Metathorax, bearing a shallow median dorsal groove. Thorax and a median transverse ridge on each segment of the abdomen, closely covered with short bristles.

When full grown, the larvæ buried themselves in the earth of the breeding jar to a depth of about an inch from the surface, and changed at once in small smooth cavities to orange pupæ, of a shape very similar to that of other Chrysomelidæ, which is well shown in Prof. Riley's figure of the Colorado Potato Beetle first published in his first Missouri Report, fig. 46 *c*., page 101. In the pupa of *E. adonidis* the abdomen is more pointed at the apex, than shown in the figure.

In the above instance, the eggs hatched in my office on November 18th, 1892; some larvæ were full grown and buried about January 1st, 1893, and several beetles emerged January 30th.

WESTERN BLISTER-BEETLE.

(*Cantharis Nuttalli*, Say.)

Attack.—Large handsome beetles, one inch long, with plum-coloured, purple or green wing cases, glossed with gold. Head, thorax and body metallic green, with the same golden sheen as the wing cases. Feelers, dull black; legs, dark purple. These insects appear suddenly upon beans and vetches in July and devour the foliage rapidly.

Occasionally reports are received of injuries done by the above named beetle, but during the past season these have been unusually numerous, as shown by the following quotations from some of my correspondents.

"Feb. 4th.—There is in this country, a beetle varying in colour, which is blue or changing violet-green or blue with golden lustre, about an inch long by a quarter of an inch wide, which feeds on leguminous plants and is very fond of both the tender leaves and flowers of Windsor Broad Beans. I will send you specimens next summer.

"July 18.—I send you herewith a few of the beetles with their favourite wild food-plant.* They made their first appearance about July 1st. On July 4th it was very hot and they came in swarms, attacking the bloom of Windsor Broad Beans, which in some gardens they completely destroyed in a few hours. I partially saved my crop by hand-picking, gathering nearly two quarts from the beans. These beetles are sure to be a serious pest if they attack anything else.

"Aug. 22.—The season of the Cantharis is quite over now."—THOMAS COPLAND, *Saskatoon, N.W.T.*†

"July 5.—Yesterday I noticed a large number of beetles feeding vigorously on my patch of Windsor Beans. The beans were in full bloom and the insects were just beginning to feed on the blosoms. To-day, the whole patch is destroyed. I send two pairs of the insects for identification and any other information you can give me. They first devoured all the blossoms and are now feeding on the more tender leaves. I have not discovered them feeding on anything but the beans yet, but fear they may try the taste of other garden stuff. I had not seen any this year until yesterday, and although I have noticed a few in other years, they have done no damage that I have seen. Are they known to do much damage to vegetation, and if so, what is the best way to destroy them?"—GEORGE L. SMITH, *Saskatoon, N.W.T.*

"July 19.—I send you specimens of beetles which have totally eaten up some Horse Beans which were growing splendidly, and to all appearances would do well in this country and be a paying crop. But if these pests are native and likely to turn up every year, there would not be the slightest use in trying to grow them, as the beetles were literally black on the plants. Can you tell me what they are and if they are liable to come every year?"—CHRIS. HALLIDAY, *Winlaw, Assa.*

* This was *Vicia Americana*, a wild vetch.

† Prof. Saunders found this insect extremely abundant in August upon cultivated tares growing upon the Experimental Farm at Indian Head, N.W.T. They were so numerous that the crop was materially reduced by their devastations. They were not found upon any other crop at that time.

The actual life history of this interesting insect has never been worked out, but from what is known, chiefly through the studies of Prof. Riley, of the life history of allied insects, there is every probability that during its larval state it lives on the eggs of different kinds of Locusts.

At the last meeting of the Association of Economic Entomologists at Rochester, N.Y., Mr. L. O. Howard stated that the experience of farmers in the Western States had been similar to ours, and that different species of blister-beetles had been sent to the department with reports of damage from various parts of the country. He suggested that their extraordinary abundance was probably due to the large numbers of grasshoppers last year. Prof. Forbes also said on the same occasion that some years ago in Illinois these beetles had been exceedingly and destructively abundant, following a season of great abundance of grasshoppers. Judging from the past, there is little fear, I think, that this beetle will appear in destructive numbers every year. In looking over all the reports received concerning the depredations of this insect, I find that they are all dated early in July, so that the time of injury would seem to be limited to a few weeks, and if a sharp watch were kept for its appearance, the ravages could be controlled either by sweeping the crop with a net mounted on a handle or by beating the beetles into a pan containing some water with a little coal oil on the top. Where the area attacked was too large for this, spraying promptly with Paris Green, 1 lb. to 100 gallons of water, would destroy them.

The Western Blister-beetle is hardly likely to be a general feeder upon garden produce although some specimens received living were kept alive for some time and fed upon clover and pea-vines. They did not however seem to relish these plants.

THE BIRCH BUCCULATRIX.

(*Bucculatrix Canadensisella*, Chamb.)

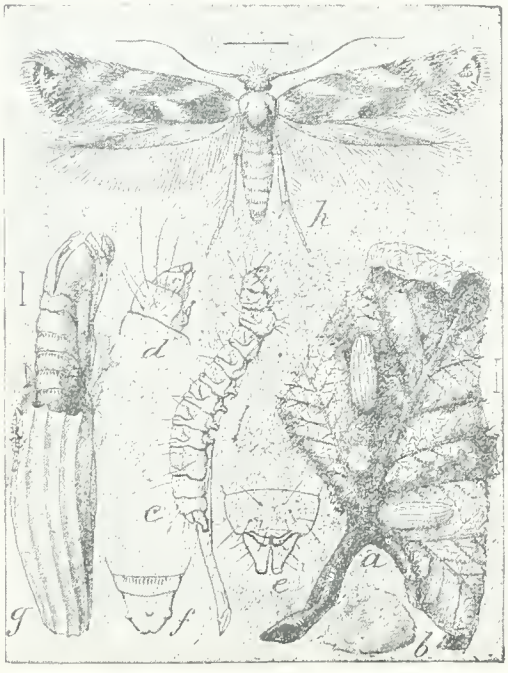


Fig. 14. *Bucculatrix Canadensisella: a*, part of attacked birch leaf; *b*, pseudo-cocoon; *c*, larva; *d*, head of same; *e*, anal segments of same; *f*, anal segment of pupa; *g*, cocoon with extended pupa skin; *h*, moth —all enlarged. (Kindly lent by Prof. C. V. Riley.)

Attack.—Numerous, slender pale greenish caterpillars, when full grown, $\frac{1}{4}$ of an inch in length; body, slender, tapering to each end, sparsely covered with fine bristles, the sutures between the segments deeply impressed; eating out portions of either the upper or lower sides of birch leaves, and leaving the epidermis of the opposite surface intact. The injuries become noticeable in August when the trees begin to assume a rusty or burnt appearance and many of the leaves fall prematurely. This attack may be recognized by the presence on the leaves of small white circular flat webs, which are spun by the caterpillars, as temporary shelters during the time that they are casting their skins. These have been styled cocoonets by Mr. V. T. Chambers (Can. Ent. XIV, p. 145); but are more properly called pseudo-cocoons by the Editors of *Insect Life* (Vol. V, p. 16). The true cocoons are spun later and are oblong, flattened beneath and longitudinally ribbed with about eight prominent ridges, a little over $\frac{1}{8}$ of an inch in length, of a pale greenish yellow at first, but afterwards dark brown, of the colour of the twigs, on which they may be very rarely found in winter.

For the last three years the birches of all kinds in the vicinity of Ottawa, but particularly on the wooded slope surrounding Parliament Hill, have been much disfigured by this insect. Upon the Experimental Farm, the attack was most severe

in the case of the varieties of *Betula alba*, but our native birches, *B. papyrifera* and *B. lutea*, have been hardly less injured.

The caterpillars were so numerous that five or six would be frequently found upon a single leaf, and the effect of their depredations was soon perceptible after they were first observed. They were particularly partial to the beautiful pendulous cultivated variety of the European birch, known as the Cut-leaved Weeping Birch, which is in the opinion of many the most beautiful ornamental tree grown.

The only remedial treatment tried was spraying the trees with a weak Paris Green mixture. This was found to be quite effective.

With regard to the life history of this genus, Mr. Chambers says as follows (Can. Ent., XIV, p. 154) :—"The larvæ of several species of *Bucculatrix* are known in Europe; but in this country until now (1882), Dr. Clemens's 'mere mention' of the larva of *B. pomifoliella*, Clem., is all that has been published. Briefly, the larval habits of the genus may be thus summarized. The larva, while very young, mines in leaves, and leaving the mine, it feeds externally, moulting once in a little cocoonet, and again in a singular ribbed cocoon where it passes the pupa stage."

Further on in the same article, the detailed description of *B. ambrosiæfoliella* shows that the egg, a minute colourless globule, is deposited on the upper surface of the leaf, and the larva, after leaving it, mines inside the leaf, where, in three or four days, it passes the first moult. After this it leaves the mine and feeds externally until the time for the next moult, when it spins beside a rib a thin sheet of white silk; beneath this it spins a small circular cocoonet, in which the body of the caterpillar is doubled into a horse-shoe shape and the second moult is passed. Emerging from the cocoonet, the caterpillar feeds externally for a few days, when, either on or near the plant, it spins the ribbed cocoon in which it passes the pupa state.

In confinement, the cocoons are nearly always spun upon the leaves, but it is very rare to find them in that position in nature. The only cocoons which I have found upon the trees, were spun on the sides of twigs, where they bore a close resemblance in colour and shape to the winter buds. From the small number, however, three only, upon a tree where thousands of the larvæ had occurred, it seems unlikely that this is the usual position of the cocoons, and it may be that they drop to the ground and spin on low plants or other objects. In confinement, the moths emerged from cocoons kept all the winter in a warm office, in the beginning of January, but none were observed out of doors until July, nor was there any trace of a spring brood of caterpillars.

The cocoon is an object of great beauty and of no less interest when the caterpillar is observed building it. I was fortunate enough to detect a caterpillar in the act of beginning its cocoon, and was able to watch the process of construction. The insect lay extended on the leaf moving only the forepart of its body. A mat was first spun on the surface of the leaf, then the foundations of the ribs were begun of silk, which hardened almost instantly after exposure to the air. Little by little these were continued, and the meshes of an open net-work stretched between them, the caterpillar all the while retreating backwards as the structure advanced. The hut-like frame was gradually enlarged, until the middle was reached, and then tapered off toward the other end, up to four-fifths of the total length. So far the work has all been done from the outside. The little builder now crawls inside the frame work, and turning round, protrudes its head from the open end, begins again in the same way as it had first started the cocoon, and continues until the two portions touch. These are then joined together by silken threads spun from one to the other inside. The caterpillar is now completely enclosed in an open framework, and, as Mr. Chambers points out, if the larva ceased to spin at this stage, the cocoon would belong to the same class as those of *Plutella cruciferarum*, and a few others which pupate in an open net-work. But it immediately begins to spin the oval true cocoon inside this, and soon becomes invisible, and the cocoon darkens in colour.

In the article above referred to by Mr. Chambers, "Notes on the larva of *Bucculatrix ambrosiæfolia*" (Can. Ent. XIV, p. 153), an extremely interesting account of the insects of this genus is given and also a detailed description of the building of

the cocoons which he had watched under the microscope, together with a figure illustrating the way in which the longitudinal ribs are built up and strengthened little by little to support the transverse thread.

There are still some points of interest in connection with this little insect which require further study. I have found upon the leaves small mines which I presume were made by the caterpillars in their first stage, but I have not actually found the larvæ of *B. Canadensisella* in these mines, nor discovered the eggs. It is important to find out the usual location of the cocoons in which the insects pass the winter. *B. pomifoliella*, which is occasionally injurious to the foliage of apple trees, and was this year very abundant at St. Catharines, Ont., spins its elongated whitish cocoon on the twigs of apple trees.

In the autumn of 1889, I found large numbers of the cocoons of another species shaped somewhat like those of *B. Canadensisella*, but rather longer and pure white in colour. These were attached to dead grass leaves and the fruiting stems of a moss, under sugar maples. It seems possible that these may have fed upon the leaves of the trees and fallen to the ground when ready to spin. I hope next season to work out completely the life history of the Birch Bucculatrix. I append a description of *B. Canadensisella.*

Moth small, wings expanding $\frac{3}{8}$ of an inch. General colour, bright brown, the wings crossed with silvery white bars, three of these run from the outer edge about half way across the wings obliquely towards the apex, and there are two shorter subtriangular blotches on the inner margin of each fore wing. These latter, when the wings are closed, form two white dorsal saddles, the anterior of which is slightly the larger, and is followed closely by a tuft of raised black scales. At the extremities of the fore-wings are also several raised black scales a few of which are separated into an apical spot by an irregular narrow white band. The cilia of the fringes are pale brown. Head white; frontal tuft dark brown in the centre; antennae brown, slender, about $\frac{1}{5}$ inch long. Thorax brown with margins including the bases of the fore-wing, white. Leg and body pale fuscous silvery.

Fig. 14 showing the various stages of the Birch Bucculatrix has been kindly lent for use in this report by Prof. C. V. Riley, and was originally used to illustrate an article by Dr. A. S. Packard, the most complete yet written on the species, which appeared in *Insect Life*, vol. V. p. 16.

ON AN EGG PARASITE OF THE CURRANT SAW-FLY.

(*Trichogramma*, sp.)

Under the above title Professor Lintner published in his Second Report, 1885, an interesting account of a minute parasite which he had discovered in 1867 and again in 1882, attacking the eggs of the Imported Currant Saw-fly in the State of New York. This injurious saw-fly, the larva of which is usually known to Canadian fruit-growers as the "Currant Worm," is a pest which demands constant attention throughout the summer, and although the ordinary applications of Paris Green early in the season and White Hellebore later on when the fruit is formed, are perfectly efficacious, cheap and simple; yet, there is hardly a district where plantations may not be found stripped of every leaf during some part of the season. It is not well enough appreciated by fruit-growers that if the leaves be stripped from a bush either by fungous or insect enemies, even after the crop is gathered, they suffer much loss thereby; for without leaves the bush cannot store up nourishment to support the crop of the next year, and although there might be abundance of flowers, the fruit will drop without maturing from bushes which were stripped the year before. In view of the above, the discovery and distribution of a parasite which would keep in check such a redoubtable enemy, becomes an important matter.

I was therefore very much pleased on the 10th of last June to find upon the leaves of a gooseberry bush in the the garden of Mr. R. Montford, at Galetta, near Arnprior, Ont., eggs of the Imported Currant Saw-fly, which showed evident signs of containing parasites. Instead of presenting the usual translucent white appearance, they were shining jet-black and showed the shape of the pupa of the parasite within.

Some of the eggs contained two parasites in different stages of development when half the egg was black and the other half paler. Only a few eggs could be found on the occasion of my visit, but later, through the kindness of Miss Montford, I received a much larger supply of parasitised eggs, some of which were distributed to different gardens in the vicinity of Ottawa. I soon found, however, that the friendly parasite was already present in strong force and I collected parasitised eggs in all the gardens I had opportunities to visit. The specimens bred by Prof. Lintner were identified as *Trichogramma pretiosa*, a species originally described by Prof. Riley (Can. Ent. 1879, pp. 161–162) from specimens reared from the eggs of the cotton moth (*Aletia argillacea*, Hüb.). As the specimens bred at Ottawa this year did not seem quite to agree with the description, some of them have been submitted to Prof. Riley, together with several specimens bred from the eggs of another introduced saw-fly which has appeared in injurious numbers upon Russian Willows at Quebec and Ottawa. His report upon them is as follows:—

"So far as can be seen from the dry specimens of the two Trichogrammas from *Nematus ribesii* and *N. pallidiventris*, they are the same, but no satisfactory examination can be made of specimens in this condition. *Trichogramma*, like *Aphelinus*, and the other little yellow-coloured, thin-skinned Chalcidids, should be mounted when fresh in balsam. It is a most difficult thing, however, to distinguish between the species of the genus." I exhibited some of these specimens at the Rochester meeting of the Association of Economic Entomologists, and Mr. L. O. Howard then told me that the genus was a most discouraging one, that he had examined carefully under high powers of the microscope some hundreds of specimens, but could find no good characters by which to separate the species; the apparent characters, viz., in the arrangement of the little hairs on the wing and the number of cells in the uncus of the stigmal club are worth nothing, and vary in individuals reared from the same batch of eggs. He agreed with Prof. Riley that the only thing to do was to wait until abundant material had been collected, when probably characters for separation of the species would be found, but it would only be by careful study and a survey of the entire field.

SOME OTHER USEFUL PARASITES.

In addition to the above record, some other equally interesting parasites came under my notice during the past season, a few of which I will mention to show the good offices performed by others as well as these minute and almost invisible insects.

The different species of *Trichogramma* are minute, four-winged, yellow insects, varying from about one hundredth to one twenty-fifth of an inch in length, with front wings broadly expanded towards the apex and ornamented with lines of hairs radiating from the base. The hind wings are narrow and more deeply fringed than the other pair. They are parasites on the eggs of many kinds of insects, frequently more than one specimen emerging from a single egg.

Parasite of an Imported Willow Saw-fly (*Nematus pallidiventris*, Fallen).—In 1891 the Rev. T. W. Fyles, of South Quebec, recorded (Can. Ent., XXIII, p. 135) the first occurrence of this saw-fly in America. He had reared it from specimens found upon a lately imported Russian willow growing in his garden. In September last this same species was found abundantly ovipositing upon the leaves of terminal shoots of *Salix laurifolia* in the botanic garden at the Central Experimental Farm. The eggs are inserted beneath the epidermis of the lower side of the leaves in open clusters of from about half a dozen to one hundred. Each egg is separate, and causes a comma-shaped swelling. The eggs hatch in about ten days, and the voracious larvæ soon strip the shoots, entirely consuming the leaves as they work down from the top. They rest when half grown on the edges of the leaves, the curved bodies standing out like a heavy fringe. They are dark green dotted with black, somewhat like the larvæ of the Imported Currant Saw-fly, to the perfect insect of which this also, although brighter-coloured, bears a considerable resemblance. Great numbers of the egg-clusters, upon examination, showed the dark colour indicative

of the presence of parasites within the eggs. Leaves enclosed in jars, gave, a month later, specimens of the *Trichogramma* very similar to the species bred from the Imported Currant Saw-fly.

Parasite of the Tiger Swallow-tail (*Papilio Turnus*, L.)—The following instance will illustrate the very small size of the parasites of the genus *Trichogramma*, and the good work they are capable of performing will be shown below under "Parasites of the Zebra Caterpillar." On July 11, I found a single egg of *Papilio Turnus* upon a low bush of *Amelanchier Canadensis*, T. and G. at Nepigon. This egg was shining black in colour, so was carefully enclosed in a small glass bottle to secure the parasites. In due time they began to emerge, and at length no less than forty-one specimens came out from the one egg, which only measured 1 mm. in height by 1·10 mm. in breadth. The species has been identified by Prof. Riley as *T. intermedium*, *How.*, a species closely resembling T. *minutum*, Riley, which was originally described from the eggs of *Limenitis Disippus*, a common butterfly.

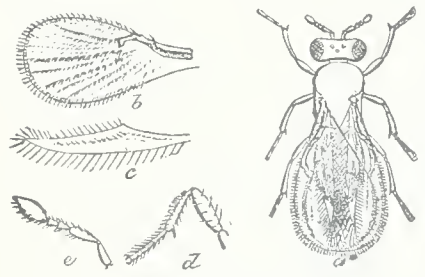


Fig. 15. *Trichogramma minutum*, Riley.

In Mr. Scudder's "Butterflies of the Eastern United States and Canada," is recorded an instance where seventy-nine specimens of *Trichogramma minutissimum* were bred from five eggs of this same butterfly, making an average of sixteen to each egg. Prof. Lintner states that six specimens of *T. minutum* have been reared from a single egg of *L. Disippus*.

Parasite of the Vancouver Island Oak-looper (*Ellopia somniaria*, Hulst.)—The oak trees in the vicinity of Victoria, B.C., have been for many years periodically stripped of their foliage, for a few years in succession, by myriads of the larvæ of the above named insect; then for a few years the trees are exempt from injury. This has been noticed by many of the citizens of Victoria and there has been much speculation as to the cause of the sudden disappearance of the marauding hosts. From material kindly sent to me, and with the valuable assistance of Mr. W. H. Danby, of Victoria, I have been able to discover several of the causes which periodically check the undue multiplication of this pest. The most effective of these is a fungous disease which has been identified by Prof. Roland Thaxter, as *Sporotrichum globuliferum*, Spegazzini as recorded in my last report. This attacks the insect in all stages of development.

From the chrysalides, Mr. Danby and I have bred numerous specimens of a yellowish Ichneumon fly (*I. cestus*, Cress.) which is easily recognized. The length is about three-eighths of an inch, and the whole body is yellowish orange with one black band across the abdomen. Besides this, a new species of *Pimpla* was bred from pupæ sent to me by Mr. Danby. This has since been named by Mr. W. H. Harrington, *Pimpla ellopiæ*, Har. (Can. Ent. XXIV. p. 99).

The above-named parasites reduced the numbers of the caterpillars last year enormously, but there was yet another enemy awaiting them. *E. somniaria* passes the winter in the egg state, tucked beneath mosses or flakes of bark. Very few eggs were to be found on the bark last winter and nearly every specimen of such as were discovered in two large consignments of bark sent by Mr. Danby, were found to be parasitised by a minute black Proctotrypid which Prof. Riley informs me is an undescribed species of *Telonomus*. Only one egg produced a caterpillar which was bred to maturity in my office upon a growing oak seedling.

Parasites of the Zebra Caterpillar (*Mamestra picta*, Harris).—I know of no plant or shrub which this bright coloured caterpillar will not attack and it is frequently a source of considerable injury. It was sent in from several localities during the summer as a pest upon cabbages and potatoes. During September I found upon a plot of Bokhara Clover (*Melilotus alba*, Lam.) hundreds of clusters of the eggs of *Mamestra picta*, many of which showed from the colour that they were parasitised. The eggs were laid in a neat close patch, entirely covering the under-

side of a leaflet right up to the edges. When parasitised they were of a dark leaden hue. Several of these egg-patches were enclosed in glass jars and in a few days thousands of specimens of a species of *Trichogramma* and about an equal number of a tiny black parasite, were found in the jars, the former of these was named by Prof. Riley *T. pretiosa* and the latter *Telonomus* (new species). Of the large number of egg-patches of *M. picta* which were collected, not one per cent gave the caterpillars of the moth, owing to the attacks of these parasites.

Parasite of the Lesser Grape-vine Sphinx (*Ampelophaga myron*, Cram.) and Tomato Sphinx (*Protoparce celeus*, Hüb.).—During the past summer, both of the above caterpillars were unusually abundant in western Ontario; very few however, apparently came to full growth, on account of the attacks of the small Braconid, *Apanteles congregatus*, Say. The eggs of this insect are laid by the female fly within the body of a caterpillar by means of a needle-like ovipositor, with which she pierces the skin. Sometimes as many as 200 eggs are laid in a single caterpillar (207 cocoons of this parasite were actually counted on a large specimen of the Tomato Sphinx found in London, Ont.) The young maggots upon hatching feed on the fatty parts of their victim and, when full-grown, force their way through its skin, and work themselves out as far as the last joint of their bodies, when they begin spinning their small white cocoons, which stand on end and present the appearance of fig. 16. From these eventually the small active black four-winged flies emerge. Besides several parasitised specimens of the Lesser Grape-vine Sphinx, which I received from correspondents, there were also some caterpillars of the Tomato Sphinx sent in for report. Mr. W. W. Hilborn, of Leamington, Essex Co., Ont., says: "I am glad to learn what you write with regard to the parasite of the Tomato worm. Never until this season, has the caterpillar of the Sphinx moth done much injury. This year both tomatoes and potatoes have suffered. In some places whole fields have been destroyed. I have about three-quarters of an acre of early tomatoes that have been injured very much, although we hand picked the caterpillars every day for some time. A week or two ago we found a few which were parasitised like the one I sent you. We did not disturb any of the caterpillars which were thus affected and now there are hundreds of them, In fact, there are now (21st August) very few that are not parasitised. I sincerely trust that this parasite will continue its good work." I found on enquiry that practically the same state of affairs as is described by Mr. Hilborn, existed over a large district in western Ontario. I give herewith a figure from which the appearance of a sphinx caterpillar bearing the cocoons of the beneficial parasite is plainly shown. It will be well if all who see such will endeavour to restrain what appears to be an instinct in man, to destroy everything belonging to the animal world, which they do not understand or which they are not afraid of.

Fig. 16—Cocoons of *A. congregatus* on Sphinx caterpillar.

DIVISION OF BOTANY.

POTATO-BLIGHT AND POTATO-ROT.

The disease known as Potato-rot (*Phytophthora infestans*, de By.) is now well established in all the potato growing countries of the world and causes more loss to the potato crop than all the other sources of injury combined. In rainy seasons it is considered inevitable by most farmers, as a result of the wet conditions alone. This, however, is not the case, and it is important to have it well understood, as soon and as widely as possible, that this disease is due to the attack of an easily recognized vegetable organism belonging to the class of fungous parasitic plants, and further that careful experimentation has proved the possibility of preventing a large proportion of the loss by a systematic treatment with certain chemical mixtures as described below.

Many letters of inquiry having been received from farmers in all the eastern provinces of Canada, I considered it advisable to write the following letter, copies

of which were sent to several of the leading newspapers for publication early in July.

There are some facts which should be kept constantly in mind. 1. The Potato-blight of the leaves and the Potato-rot of the tubers are both due to the same cause. 2. This cause is a fungus which can be controlled. 3. The dry-rot seen in potatoes when they are planted in the spring as seed, produces both the blight on the leaves in August and the wet-rot of the tubers in autumn. 4. No potatoes containing patches of dry-rot should be planted as seed.

Remedy for Potato-rot.

"Ottawa, July 7th, 1892."

"To the Editor of———.

"Sir,—There are few diseases of field crops which are the direct cause of more loss to the farmers of Canada than that which is known under the different names of 'Potato-rot,' 'Potato-blight' or 'Potato-rust.' My object in writing this letter is to draw the attention of your readers to the fact that a practical and simple remedy has been discovered, and that the best time for applying it is during the latter half of this month.

"This disease of the potato is due to the attacks of a parasitic fungus, known by the name of *Phytophthora infestans*. The life history of this fungus is briefly as follows: The fungus passes the winter inside the potato tuber and is planted with it in the spring. As soon as the potato throws out its shoots, the parasite grows with it, running up through the tissues of the stems, and from about the end of July produces beneath the leaves an abundance of spores, or seed-like bodies. These are exceedingly minute, but are produced in such numbers that they frequently give a frost-like appearance to the under sides of the leaves. When these spores are produced on the leaves the appearance known as 'rust' shows itself in the shape of dark brown spots, which are caused by the drying up of the tissues, from the parasite having used up their contents. From the rust stage all future infection takes place. Some of the spores are carried by the wind and falling upon the leaves of other adjacent plants, produce more rust spots, while others falling to the ground are washed beneath the surface, and reaching the forming tubers produce the rot stage. The wet-rot, as seen in autumn in the tubers, is the form of this disease which is best known, but Potato-rot is really a dry rot which kills the tubers, and in autumn the wet-rot follows as a result of decay. In winter the disease occurs in the tubers, as patches of hard, whitish, diseased tissue.

"In this district the rust stage does not generally appear until about the first of August and this is the first evidence that blight is present in the field. As a rule the dark spots appear only on a few leaves at first, but if the weather be favourable the disease spreads rapidly from spores carried by the wind from these centres of infection, so that a large field may become diseased in a few days, and as a result the crop of potatoes ruined.

REMEDY.

"Careful experiments have shown that by spraying the potato haulms at the time the rust first appears, with the mixture of sulphate of copper and lime, known as the 'Bordeaux mixture,' the rust or blight on the leaves can be stopped, and as a consequence a large proportion of the rot in the tubers can be prevented.

BORDEAUX MIXTURE.

Copper sulphate	6 pounds.
Lime, fresh	4 pounds.
Water	45 gallons.

"To make Bordeaux mixture—Take six pounds of copper sulphate (blue vitriol) powdered, and dissolve it in one gallon of hot water in a wooden tub (iron must not be used, as the vitriol would attack it.) Slake four pounds of lime in sufficient water

to make a thin whitewash. Strain this through a fine sieve or a sack to remove all lumps. When both liquids are cool, pour the lime-wash into the copper sulphate solution, stirring it all the time. Now add enough water to make forty-five gallons, and the mixture is ready for use. It is best to prepare the mixture some time before required, but it must be kept covered to keep out all dust and rubbish.

"To apply this mixture to the foliage, undoubtedly the best and cheapest way is to use a proper spraying pump and nozzle, but if these are not on hand, good results which will well repay the trouble, may be obtained by applying the mixture with watering cans supplied with fine roses. There are several different kinds of spraying pumps in the market. Perhaps the most convenient for this work is a force pump attached to a barrel on wheels, to be drawn through the field by a horse. Smaller machines, known as Knapsack Sprayers, consist of a reservoir containing a small force pump, which can be carried upon a man's back. Both of these kinds of pumps can be purchased for about $10 to $20. It will be necessary to spray the fields two or three times to protect the crop thoroughly. There is no danger of injuring the foliage with the above mixture, as it is only half the strength of the original formula which is generally used.

"A great advantage of this mixture is that Paris Green, the only practical remedy for the Colorado Potato-beetle, can be applied at the same time. To do this, mix from a quarter to half a pound of Paris Green with a little water so as to make a thick paste, and then add it to the 45 gallons of Bordeaux mixture; that is, it is used in exactly the same strength as with plain water.

"These mixtures must be kept constantly stirred while being used, as both the lime in the Bordeaux mixture and the Paris Green sink quickly to the bottom of any mixture if left undisturbed."

The above recommendation was carried out here on the Central Experimental Farm amongst other experiments, Paris Green being added in the proportion of 1 lb. to 90 gallons of the Bordeaux mixture, and on the whole it produced as good results as any of the several mixtures tested. The insects which gave most trouble at Ottawa this season were, the Colorado Potato-beetle (*Doryphora* 10-*lineata*, Say). The Cucumber Flea-beetle (*Epitrix cucumeris*, Harris.) which eats small holes in the surface of the leaves, and Professor Jones, of Vermont, thinks it thus makes a starting point for the fungus *Macrosporium solani*, to injure the tissues. Later in the season the Large Red-headed Flea-beetle (*Systena frontalis*, Fab.) caused injuries similar to those of the last named enemy. All of these were kept in check by the Paris Green and Bordeaux mixture combined.

Having had considerable correspondence with Prof. L. R. Jones, Botanist to the State Agricultural Experiment Station at Burlington, Vermont, about the best means of controlling this disease, a series of joint experiments was planned, to be carried out contemporaneously at Burlington and Ottawa, with the same mixtures and as far as possible, with the same varieties of potatoes. The results of these experiments will be very useful for comparison with later work; but owing to unforeseen circumstances it is unadvisable to give now the full details of this year's experiments at Ottawa. These circumstances were, in the first place a very great inequality in the character of the soil in different parts of the field where the plots were measured off for trial; a severe and prolonged drought set in during the month of July and lasted till the 28th of that month, so that many of the varieties in poorer parts of the field were injured beyond recovery. This drought was more severe on account of following a very wet June. Again the Potato-rot was far less prevalent last season in this immediate district than usual, so that although there was practically no rot among the sprayed potatoes, neither was there any worth mentioning among those which were not treated.

I may however state that the general results were most encouraging, and the effect of the different treatments was conspicuously apparent upon the block of sprayed potatoes, which occupied the middle of the field, as compared with those which surrounded them, and which had been left unsprayed. Untreated vines had lost every vestige of foliage by the beginning of September, while some of the sprayed varieties remained perfectly green up to the time the crop was dug, on October 8th.

The defoliation this year of unsprayed vines was probably due more to the attacks of another disease caused by the fungus *Macrosporium solani*, and of insects, than by the true Potato-blight. Upon sprayed vines, however, these were not nearly so injurious, and although after all the unsprayed vines had been defoliated the insects congregated in myriads upon the still green leaves of the sprayed plots, and many of the plants were little by little eaten away, enormous numbers of the insects were found dead which had paid for their meal with their lives. The importance of the foliage being preserved as long as possible, was shown by the far larger crop of those varieties which held their leaves longest, and this not so much in the number of tubers as in their size. Two varieties which were remarkable for their power of resisting all enemies were "Holborn Abundance," and the "State of Maine." The following varieties were also noticeable, McIntyre, Empire State, St. Patrick, Clark's No. 1, Burpee's Surprise, White Star, Mammoth Prolific.

LAWN GRASSES AND FODDER PLANTS.

The experiments in testing the value of various foreign and native fodder plants, have been carried on in accordance with the plan already treated of at some length in previous reports. During the past season about one hundred and fifty different species and varieties were cultivated at Ottawa, and notes taken of their yield per acre, nutritive value, hardiness and suitability for agricultural purposes. One hundred and sixty-one collections containing seeds of thirteen of the most promising varieties of grasses, in all 2,173 samples, were distributed to be tested in the different provinces of the Dominion. In addition to the above, twelve larger samples of the valuable Austrian Brome grass were sent out for testing on a larger scale. The grass plots proved an attractive feature of the farm work to the large number of farmers and botanists who visited the Central Farm. An interesting addition was made to the collection of fodder plants, in the shape of all the different varieties of clovers of which seeds were advertised for sale by seedsmen in this country and in Europe. These were all sown last spring and made a good growth for the first year; but it remains to be seen how they will pass the winter.

Attention was also given to the important question of Lawn Grasses, with regard to which perhaps more enquiries are received than any other subject connected with grasses. An interesting bed was laid out in the shape of "a grass mosaic," sown in the pattern of the "Union Jack." The plan was suggested to me by Mr. J. B. Olcott, of South Manchester, Conn. A plot two rods long by half a rod wide, was used for the purpose. First of all a wide St. George's cross (one foot wide) was sown in the centre with Hard Fescue (*Festuca duriuscula*); lying over this, the two centres meeting, was a St. Andrew's Cross of half the width (six inches), sown with Sheep's Fescue (*Festuca ovina*), and the eight angular spaces lying between the limbs of the two crosses were sown with different grasses. These were chosen so as to give the greatest variety of colour. In the very centre where the crosses met a small patch of another grass was planted. The object of this experiment was to show the unadvisability of sowing lawns with mixtures containing a large number of different varieties of grasses. What is required in a lawn is a sward of uniform colour and even texture. This cannot be secured if many varieties are sown together. When examined, grasses will be found to vary very much indeed, both in colour and the nature of their leaves, as to width, fineness and rigidity. This fact was well illustrated by the plan adopted, which attracted the favourable notice of many visitors. The satisfactory conclusion was arrived at that for good lawns in Canada, no grass could compare with the common June grass of our roadsides (*Poa pratensis*, L.), also called "Kentucky Blue-grass," or Spear grass, and in Europe, Smooth Meadow-grass. For a permanent bright colour, evenness of growth and softness of texture, as well as its iron-clad hardiness and power to withstand abuses, this grass has no equal. It was, too, almost invariably proclaimed the best in appearance, by all who were asked for an opinion, whether they knew the different grasses or not. The seed is easily procured, is cheap and is nearly always clean,

as it ripens its seeds before most of the weeds which grow among grasses. Enough seed for a good large lawn can be gathered in an hour by the roadside at the end of June by anyone who will take the trouble to do so. After a week this will be dry enough to rub out all the seed, which may be sown at once. For a successful lawn, the soil should be of good depth and well drained. The surface should be ploughed, levelled, and rolled smooth in autumn. In the spring it should be again rolled, the seed sown and then lightly rolled or raked in. The seeding should be thick, in the proportion of as much as 3 to 3½ bushels of June grass to the acre, to which ¼ lb., of White Clover may be added. If the soil be moist, about half the above quantity may be made up of one of the many fine-leaved forms of *Agrostis* or Bent grasses, such as *A. stolonifera;* but the colour of this latter is of a decidedly different shade of green, and it must be done with the idea that the Bent grass, if more suitable to the soil, is ultimately to supplant the June grass. In the mosaic mentioned above the following grasses were used.

1. Hard Fescue (*Festuca duriuscula*), dark blue-green (hair-like leaves).
2. Sheep's Fescue (*Festuca ovina*), yellowish green (hair-like leaves).
3. Wood Meadow grass (*Poa nemoralis*), intense vivid green.
4. June grass, Kentucky Blue-grass (*Poa pratensis*), bright green.
5. Red Top (*Agrostis vulgaris*), pale green.
6. Squirrel tail (*Hordeum pratense*), pale glaucous green.
7. *Eatonia Pennsylvanica*, bright yellow-green.
8. Wire grass, Canada Blue-grass (*Poa compressa*), dark purplish green.
9. Water Bent grass (*Agrostis stolonifera*), pale yellowish green.
10. Meadow Foxtail (*Alopecurus pratensis*), darker green than No. 5.
11. *Agrostis scabra*, glaucous variety, pale green (hair-like leaves).

The recognition of the colours and varying textures of grasses suggests many ornamental uses for these plants, such as the permanent marking out of tennis courts or other ornamental patterns on lawns.

Chess (*Bromus secalinus*, L).

In my annual report for 1891, I stated that at the request of one of my correspondents I had planted 100 grains each of Chess seed and Fall wheat, with the purpose of proving that, in the first place, Chess would come true from seed and produce seed from which Chess and nothing else could be grown; and secondly, that no adverse treatment could produce a plant of Chess from a grain of Fall wheat. As stated, 100 grains each of Chess and Fall wheat were sown in September, and each grain was marked with a small picket. I had a witness present with me during the whole sowing operation, according to agreement. In addition to the 100 grains, a single row 8 feet long and 2 inches wide was also sown of each kind of seed.

Chess.—The Chess seed all germinated and appeared above the ground in the autumn of 1891. In the spring of 1892 it grew rapidly, as soon as the snow water, which lay on it for a fortnight, soaked away. The flowering panicles appeared May 27, and the seed was ripe by the end of July. The single row was cut down twice and continued throwing up flowering spikes until September.

Fall Wheat.—Most of the seed germinated and appeared above the ground in the autumn of 1891.

During the winter of 1891–92 the snow was shovelled off half the bed three times, so as to expose the young plants to the weather. In the spring, water lay on half this plot for a fortnight after the snow melted. In April half the single row was stamped down into the muddy ground with the heel of my boot and the other half was cut off close to the ground with shears. After this the plot was left alone.

RESULTS.

Chess.—Nearly every grain grew and produced a strong plant of Chess with many stems which bore an abundance of seed.

Fall Wheat.—Many plants of the 100 were drowned out by the water lying on them in spring; 42, however, grew and all produced Fall wheat. Of the single row,

both the plants which were stamped into the muddy soil and those which were cut down, grew equally well with the others and all produced Fall wheat.

To the above record I will add that of a single row of Chess sown in the spring of 1892, only one plant produced flowers that year. The plants went into the winter in healthy condition and will doubtless flower next spring.

In view of the above, I repeat again what I said last year; "There is only one remedy for Chess—to sow clean seed-wheat in clean land." If this be done there will be no trouble with Chess. Some thousands of farmers had this experiment brought under their notice during the season, and I trust that some of them may have been convinced that Chess cannot be grown from the seed of Fall wheat, whatever adverse circumstances it may pass through, any more than a rose can be grown from an onion seed. An illustration of the absurdity of the contention frequently put forth at Farmers' Institute Meetings, that Chess is a bastard grain and, therefore, cannot produce seed, is the fact that it is now largely grown in Oregon and Washington States as a hay grass. It is claimed to have a special value from growing on land impregnated with alkali and unfit for the cultivation of Timothy. Mr. W. Tasker, of Ladner's Landing, B.C. writes. "I received some rye grass seed from Canada four years ago and found the following summer that it was nearly all Chess. I cut it for hay and the horses ate it well. Later, I was at Salem, Oregon, at the State Fair and saw the same grass among others labelled "Brome Grass." In speaking to the Manager of the Experimental Farm he told me that it made fair hay and if sown in the fall on land which turns white, a good crop of hay could be cut the following summer. It occurred to me that this meant alkali land. I afterwards learnt that it was a good deal cut and when Timothy was worth $10 per ton, it was worth $8. It is from three weeks to a month earlier than Timothy. When I came home from Oregon I gathered enough seed to sow half an acre. It yielded well and I harvested enough to sow nine acres of fallow with Chess and Red Top, and twenty acres of Chess and Timothy sown only on the surface, the other was harrowed in. The hay has the appearance of being good. I would not recommend sowing Chess where Timothy will do well, but in the North-west where there is Alkali in the soil it might be well to try it. Chess can be sown in the fall, a crop of hay reaped the following June, and the land then fallowed. I sow at the rate of 50 or 60 lbs., to the acre. Some complain of having Chess in their Timothy, I told one man he could get rid of it by cutting before the Chess had seeded when it will be done with, as it is only an annual; but if it is cut very early it will grow again from the roots, like oats cut for hay. Feeding off with sheep will finish it. When grown with Timothy, if left until the latter is ready, the Chess seed has fallen to the ground. Chess is hardier than Fall wheat. I had some last winter which was covered 8 inches deep with salt water for 3 days, and yet it came through all right. I never heard of Chess growing from Fall wheat or of killing pigs by the moon until I came to America."

The following letter containing much valuable information on this subject, has been received from Professor Moses Craig, Botanist of the Oregon State Agricultural College, in reply to an enquiry :—

"CORVALLIS, Oregon, 15th November, 1892.

"In reply to your letter of enquiry regarding the use of Cheat as a forage plant, I would say that in this (Benton) county, Chess (meaning mainly *Bromus secalinus*, *L.*, though *B. racemosus* and *B. sterilis* are occasionally mixed with the above), grows well, and is considered by most farmers to be as good as Timothy, selling readily for the same price—$12 a ton. This applies mainly to the hill regions, as in the valleys other grasses can be profitably grown.

"It endures the dry dusty summers much better than Timothy (*Phleum pratense*, L.), and is often sown in 'slashes' or freshly cleared and burned over land, where it makes a good stand. In the ranches of the Cascades when mixed with Wild Oats (*Avena fatua*, L.), it forms the entire food of cattle.

"Perhaps I can best answer your questions by giving the views of my correspondents:—

E. P. Williams, Lane County, says:—I sow Cheat for fodder, and find it excellent for all kinds of stock.

J. Bagley, Polk County, says:—Very good hay for cattle and sheep.

S. P. Reeder, Washington County, says:—Cheat grass makes good hay for horses or cattle.

C. D. Steen, Linn County, says:—Wild Oats and Cheat make good hay if cut green.

E. F. Messner, Josephine County, says:—Chess makes good hay for horses, sheep and cattle.

Wm. Miller, Lane County, says:—I feed Cheat to horses and cattle, and consider it a fair quality of hay.

J. D. Hayes, Josephine County, says:—Chess makes fair hay for cattle.

J. G. McCune, Linn County, says:—I consider Chess of great value as hay for horses and cattle.

Ernest Eggerth, Umatilla County, says:—Have used it to feed stock and horses. Cheat hay made when in bloom makes good hay, but not equal to Timothy.

G. R. Stephenson, Multnomah County, says:—I consider it of no value.

S. W. Miles, Polk County, says:—Wild Cheat not of as much value as the tame hay.

L. P. Williams, Clackamas County, says:—Wild Oats and Chess may have some value as feed if cut early enough, but as they open before Clover and Timothy, their value is limited."

"I think that Chess grows *much better* on 'white land' or soil impregnated with alkali than does timothy and other tame grasses. In regard to the time of sowing Cheat for pasture, some sow in the fall, giving a spring pasture, others sow in the spring for late summer pasturage. For hay the seed is usually sown in October.

Opinions differ regarding the value of Cheat, but in the mountains, foot-hills, and on white land, large quantities are annually saved for hay, and for these localities there is nothing to take its place except Wild Oats.

In the valleys no one raises it, as other grasses will give better returns there."

I have reproduced the above letter in full, as it contains much that may be of use to British Columbian and North-western farmers.

REPORT OF THE POULTRY MANAGER.

(A. G. Gilbert.)

To William Saunders, Esq.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit to you the fifth annual report of the Poultry Department for the year ending 15th January, 1893. In my last report, which extended to 29th February, attention was given to the effect of a morning warm ration on a certain number of fowls. The ration was composed of :—

	Lbs.	Oz.
Bran	2	8
Shorts	2	8
Ground meat	1	8

with clover hay and a small quantity of coarse sand and fine ground oyster shells mixed, with the object of preventing eggs being laid with soft shells, or no shells at all.

It had been noticed in previous years that the laying stock were most addicted to the vicious habits named during the month of March. Consequently, careful attention was paid to the layers during that period, and it was found that the vices were not indulged in to the same extent as formerly. This may have been owing to the mixing of the oyster shells and coarse sand in the soft feed, but no definite conclusions could be arrived at from one observation. The same ground is being gone over this season with certain additions to the rations of last winter, which are noted elsewhere.

SOME OBSERVATIONS AND THEIR RESULTS.

It was observed, however, that the fowls in the pens containing the lesser number were freer from vice than the more crowded ones, thus showing the benefit of room and comparative range. The importance of farmers giving their laying stock as much room as possible was impressed upon them in my last report in the following words :—"The layers do better when they can enjoy as much freedom as possible. Many farmers have their poultry houses so arranged that with very little trouble or expense they can allow their fowls access to a barn, stable or enclosed shed, where gravel, sand, coal ashes or other substances may be found for the hens to scratch in. Fowls so situated are not likely to give way to egg or feather eating, or laying eggs with soft shells or no shells at all." The experience of the past season confirms this. The observations of the past few years also lead to the conclusion that in constructing winter habitations for fowls it would be a good plan to have half of the floor of the pen covered with straw litter and the other half with coarse sand and gravel, or half wooden flooring and the other half dry earth. Placing the earth on the board floor would be more likely to keep it dry, which is absolutely necessary. Experience with earth, on board floors, has shown that it would not be necessary to remove the earth for three or four months, provided it was occasionally raked over and a small quantity added at the same time.

A TEST OF DIFFERENT BREEDS.

A good opportunity was afforded of trying different breeds in enforced confinement when the breeding house was completed at the end of February last, but the construction of the outside runs was unavoidably postponed for some months later. The house

contained 12 pens 8 x 5 feet each, and they were calculated to hold five or six females and one male. The following were placed in the building :—

Pen 1.—White Leghorns : 7 pullets, 1 cockerel.
" 2.—Black Minorcas : 5 hens, 1 cockerel.
" 3.—Andalusians : 5 pullets, 1 cockerel.
" 4.—Plymouth Rocks : 7 pullets, 1 cockerel.
" 5.—Wyandottes : 5 pullets, 1 cockerel.
" 6.—Houdans : 5 hens, 1 cockerel.
" 7.—Black Hamburgs : 6 hens, 1 cockerel.
" 8.—Langshans : 4 hens, 1 cockerel.
" 9.—Buff Cochins : 5 hens, 1 cockerel.
" 10.—Red Caps : 3 pullets, 2 hens, 1 cockerel.
" 11.—Coloured Dorkings : 4 pullets, 1 hen, 1 cockerel.
" 12.—Golden Polands : 3 hens, 1 cockerel.

The results desired to be gained by observation of the breeds named in close confinement were :—

1. The breed to first develop vice.
2. What that vice might be.
3. What breeds stood the close confinement best.
4. To find a remedy, if possible, for any vice developed.

When the fowls were placed in the house the floor of the pens was covered with straw litter, but some of the heavier breeds became so palpably out of condition that a change of some kind became necessary. The straw litter was removed and coarse sand and fine gravel substituted. This had a beneficial effect, as the condition of the stock quickly improved. Vegetables, grit, &c., &c., had been supplied to the different pens.

RESULTS OBSERVED.

The first to develop any vice were the Black Minorcas, which after laying well for two months began feather eating.

They were followed soon after by the Andalusians which displayed the same vice. This breed did not lay, meanwhile, as many eggs as the former.

The Black Hamburgs, Wyandottes and Red Caps followed and it became evident that change of treatment was at once necessary, or all would go the same way. The Red Caps, Dorkings, Buff Cochins and Houdans were removed to a larger pen, with outside run, and the Black Minorcas were allowed out to run at large, but. as it was the breeding season only one pen of fowls could be allowed out at a time. The worst cases were let out oftener than the others. As soon as the fowls got out they ceased the vicious habit. It was noticed that while the Minorcas picked feathers vigorously they did not eat eggs, but this may have been owing to a nest box of improved pattern and which kept the eggs more secluded than those formerly in use. Or, it may have been owing to the gravel and grit always on the floor.

THE REMEDY.

The only effective remedy found was to let the fowls outside. It was plainly evident that the long winter confinement in the one house protracted in the more limited space of the second was the cause of the feather picking. This experience goes to show that while meat, grit, vegetables, &c., are absolutely necessary at all times, and are no doubt deterrents up to a certain date, that close confinement will eventually end disastrously,—another strong argument in favour of as much freedom as possible, under all circumstances, to both laying and breeding stock. It may be noticed that no bone food of any sort was used, although ground meat was given at stated intervals. Some time ago a mill for cutting green bones was procured and the bones so cut (not ground) are being fed at regular intervals. It will be interesting to note the effect, as much has been claimed for a "green bone ration," one of the claims being the prevention of feather and egg eating.

SOME OBSERVATIONS.

Briefly stated, the observations noted were :—

1. Six Black Minorca hens after laying well for some months were the first of 15 breeds to develop feather picking.

2. The replacing of the straw litter on the floor of the pens by earth, had a good effect.

3. The earth on the board floor, occasionally raked over and renewed kept remarkably clean for 5 months.

4. The most of the droppings were deposited during the night on the platforms under the roosts. These platforms were cleaned every morning and folded up against the partitions, so allowing more scratching room.

5. Keeping the pens scrupulously clean seemed to teach the fowls cleanly habits.

6. The earth when removed was a valuable manure.

7. That close confinement may be borne for a longer or shorter period, according as the essentials are supplied, but eventually ends disastrously.

8. The only remedy found was allowing the fowls outside range.

9. When it is impossible to allow the fowls, in winter, to shed, barn or other scratching ground, put fewer in a pen.

A CONTRAST.

In the pen next to the Black Minorcas were six White Leghorn pullets (yearling hens in May). Under the same conditions they laid well, six eggs per *diem* being occasionally gathered from them. They developed no vice and kept in excellent condition although evidently anxious to get out. This result was as surprising as it was unexpected for belonging to the nervous, high flying, Spanish class, it was not anticipated that they would stand the strain as well as the heavier Asiatic breeds. Perhaps this one case should not be taken as a criterion.

Breeding Pens made up.

The different breeding pens were made up as follows :—

Breeds.	Number in Pen.	When Mated.
Langshan	4 hens, 1 cockerel	March 5.
Andalusian	5 pullets, 1 cock	do 8.
Golden Poland	3 hens, 1 do	do 9.
Plymouth Rock	7 pullets, 1 cockerel	do 17.
Brahma	7 hens, 1 do	do 17.
White Leghorns	7 pullets, 1 do	do 25.
	Crosses.	
4 Plymouth Rock hens 3 Brahma hens	White Leghorn, cock	April 8.

Other breeding pens were made up as stated in another page describing the behaviour of certain breeds in close confinement. The Buff Cochins are omitted from the list, as the pen was broken up, owing to the death of two hens and the cock. The Plymouth Rock cockerel also died but another fine bird was purchased and placed in the pen. Such was the demand for eggs during the hatching season that extra pens had to be made up of White Leghorns and Plymouth Rocks ; and still all the orders could not be supplied. The following birds were purchased in order to infuse new blood :—1 Brahma, cockerel ; 1 Langshan, cockerel ; 1 White Leghorn, cock ; 1 Plymouth Rock, cock. The new breeds added to the stock were Red Caps, Coloured Dorkings and Golden Polands.

Eggs set and Chickens Hatched.

When Eggs were Set..	Description of Eggs.	No. of Chicks hatched.	When Hatched.	Remarks.
March 25...	11 Red Cap	7	April 15...	
do 28...	7 do 7 Coloured Dorking	5	do 18...	
April 19...	12 Plymouth Rock	10	May 10...	
do 23..	13 Andalusian	12	do 12...	From Toronto.
do 30...	13 Crosses White Leghorn and Brahma.	5	do 20...	
do 30...	13 Buff Cochin	4	do 20...	Imported.
May 12...	9 Crosses, 4 White Leghorn	9	June 2...	
do 16...	13 Black Minorca	11	do 6...	From Guelph
do 16...	do	8	do 6...	do
do 22...	do	7	do 11...	
do 23...	13 Plymouth Rock	9	do 13...	
do 24...	13 White Leghorn	5	do 14...	
do 27...	13 Crosses White Leghorn and Brahma..	8	do 17...	
do 27...	6 Brahma, 7 Langshan	7	do 17...	
do 31...	6 White Leghorn, 7 Langshan	13	do 21...	
June 4...	13 Langshan	9	do 25...	
do 9...	7 White Leghorn, 6 Wyandotte	8	do 30...	
do 13...	6 White Leghorn, 5 G. Polands, 2 Wy.	10	July 4...	
do 14...	7 Black Minorcas, 6 Brahma	8	do 5...	
do 18...	7 Wyandottes, 6 Plymouth Rock	2	do 9...	
do 18...	5 B. Minorcas, 5 Brahma, 3 G. Poland.	11	do 9...	
do 22...	7 Wyandottes, 6 Brahma	4	do 13...	
do 29...	7 Langshans, 6 Golden Polands	9	do 20...	

It will be seen from the above that some of the eggs procured from a distance hatched remarkably well. As instances may be mentioned, 26 Minorca eggs from Guelph, and 13 Andalusian eggs from Toronto, the former giving 23 chicks, and the latter 12. In another case, but later in the season, 15 of the farm eggs resulted in 14 chicks. On the other hand, 13 Buff Cochin eggs from the United States yielded only 4 chicks. As a rule, eggs which come from, or go to a long distance, do not give satisfactory results.

The Sitters—A Few Points.

Full instructions as to the proper management of the sitting hens will be found on page 209 of 1890 report, copies of which can be had on application. A short summary may be useful to those who have not read previous reports.

1. For an early sitter select a medium sized hen.

2. In the early part of the season give 11 eggs. More are apt to be chilled, unless the nest is in a very warm place.

3. If possible set two hens, about the same time. On the fifth or sixth day test the eggs, remove the unfertile ones and give the remainder to one hen, resetting the other.

4. The nest should be made of cut straw, and placed in a quiet spot away from the laying stock. It should be well dusted with carbolic disinfecting powder.

5. China eggs should be placed in the nest, and the sitter allowed to remain on them for two days before the valuable eggs are given to her.

6. Meanwhile the carbolic disinfecting powder has probably rid the body of any vermin.

7. During the hatching period, the nest and hen should occasionally be dusted with disinfecting powder.

8. The sitters and eggs should be examined every morning, to see if all is right.

9. Should an egg be broken in the nest, the others ought to be at once taken out, gently washed in luke warm water and replaced under the sitter. If soiled, the nest straw should be replaced by clean stuff.

10. Machines for testing eggs can be procured at a cheap price from an incubator maker, or a drawing of one may be had from a poultry paper, and a local tinsmith can easily do the rest.

Care of the Young Chicks.

The proper care of young chicks is most important and indispensable to their quick maturing, as market fowls or early layers. And yet few farmers push their young stock with the proper food and frequent feedings absolutely necessary to make plump chickens for market. It is poor economy to hatch out a number of chickens and allow them to die from want of care, proper housing or food, and yet the money lost to the farmers of the country every year from all the causes mentioned is very great. With a little exertion a better quality of poultry could be put on the market by the farmers, and superior quality would soon result in better price. It may be said that young chickens demand close and frequent attention. May not the same be said of every department of the farm ? With this difference that poultry will make a quicker return from date of hatching than any other live stock on the farm. With proper management the cockerels should be marketable in three to four months, and in five to five and a-half months the early pullets should be layers at a time when eggs are high in price. And such results should be obtained in many cases with food, much of which would otherwise be wasted. The proper care and management of chickens from time of hatching to maturity has been gone into at length in 1890 report, page 212. For the information of those who have not seen that report, the following brief recapitulation may be given :—

1. After hatching out, the chickens should remain undisturbed in the nest for 24 hours.

2. Their first feed should be stale bread soaked in milk and squeezed dry, and stale bread crumbs. This may be continued some days.

3. Weather permitting, the hen and brood should be placed in a dry coop on the grass, where the chicks can get at and into the latter.

4. If kept indoors the chicks must be kept on earth, or on boards covered with earth. If not so kept, disaster will follow.

5. After being kept on the bread and milk diet for a week, granulated oatmeal or small particles of cracked corn may be added. At the end of two weeks whole wheat may be fed, but not before.

6. Care should be taken that the chicks are in no way stinted during the first five weeks of their existence. They should be pushed at all times but require particular attention during the period named.

7. Young stock require frequent but light feeding. It must be remembered that a stinted chicken will never make a good market fowl.

8. The earlier hatched, the sooner will the pullets lay.

9. The aim should be to have the pullets laying while the hens are moulting. A supply of new laid eggs all the year round will so be secured.

One of the obstacles in the way of obtaining early chickens is the difficulty of obtaining early sitters. This may be overcome by the use of a good incubator. As artificial incubation becomes simplified and results more certain, so will it become more generally adopted. Again, if the farmer's hens laid as well during the winter season, as they ought to do and will do, if properly managed, there would be more early sitters.

Growth of the Chickens.

The experience of the past five years shows that the Plymouth Rock cockerels make the most rapid growth of any breed so far tried. A cross of Brahma-Dorking during the past season grew quickly and attained large size making 4 lbs. in 3 months and 15 days. The following weights show the progress made by the breeds mentioned.

Plymouth Rocks.

Five cockerels hatched on the 10th May weighed on the 2nd August following :— 2 lbs. 07 ; 2.05 ; 2.02 ; 2.01 ; 1.10.

The same birds weighed on the 14th September, 5 lbs. ; 4.11 ; 4.06 ; 4.04; 3.07.

Buff Cochins.

Three cockerels hatched on the 20th May weighed 2 lbs 03 ozs.; 1.15; 1.15 on 2nd August.

Langshans.

Three cockerels hatched on the 20th June weighed on the 17th September 3 lbs; 2·07 lbs. and 2·12 lbs. On the 20th December the same birds weighed 6·03 lbs., 6·02 lbs. and 6 lbs.

Crosses.

The following will show the progress made with the crosses named:—

Brahma-Dorking Cockerel—Hatched on 18th April; weighed on 2nd August, 4 lbs.; on 6th September, 5 lbs., 14 oz.; on 18th October, 7 lbs., 12 oz. This has been the most satisfactory cross so far made.

White Leghorn-Brahma cross—Two cockerels hatched on 20th May, weighed on 15th September 3 lbs., 7 oz., 3 lbs. 6 oz.; on 28th October, 5 lbs.; 4 lbs., 15 oz.; on 20th December, 6 lbs., 4 oz; 6 lbs.

The pullets of the last named cross promise to make large fowls and excellent layers. A pullet hatched on 20th May laid her first egg on the 4th December. On the same day a pullet of the same age, but of the White Leghorn-Plymouth Rock cross, also laid her first egg. The females of the White Leghorn-Plymouth Rock cross have been found hardy fowls and good winter layers. The Brahma cross is being tried for the first time.

July Chickens.

Taken as a whole the progress of the chickens was very satisfactory. In no case did a Plymouth Rock, Brahma, Langshan or White Leghorn chick die. All exhibited vigour and hardiness from their hatching. Careful note was taken of the progress of the chickens hatched in July. They were slower to get on their legs than the earlier ones, and despite care, good feeding and precautions against lice, several wilted away and died. In some cases it was a difficult matter to rid the ailing chicks of lice, indeed the latter seemed to take to the weaklings. There can be no doubt that July chicks have a trying ordeal to undergo, for they have to withstand the intense heat of the midsummer months on one hand and the chill fall rains on the other. The early hatched chicks are the most profitable for the farmer. The hatching of late chickens should be avoided, but when impossible to do otherwise the growing stock should be kept under trees in preference to any other kind of shade.

Beginning of Winter Laying.

The hens went into winter quarters at the end of November. Most of them appeared to be over their moulting by that time. During their moulting the hens had a free run and were generously fed. An Andalusian pullet hatched on the 12th of May was the first to lay, on the 21st November. A Plymouth Rock pullet, hatched on the 10th May, was next to follow on the 24th of the same month. A pullet of the White Leghorn-Brahma cross, hatched 2nd June, laid first egg on 14th December. A pullet of the White Leghorn-Plymouth Rock cross, hatched on the same day as last named, laid on the same day.

The first hens to lay after moulting were the White Leghorns, Black Minorcas, Andalusians, Plymouth Rocks, Langshans, Wyandottes and Red Caps, in the order named.

An Experience of Cold Weather.

The day before last Christmas was remarkable for the weather becoming exceptionally cold. With few variations the low temperature has continued to date, 14th January. On one occasion the thermometer registered 30 below zero, and the cold was accompanied by a piercing north-west wind. In the farm poultry houses the cold was severely felt, the lowest point marked by the thermometer on the 24th Decemher was as follows:—

Main poultry building	.....	20	below	freezing.
No. 2	do	do	.....	22	do	do
No. 3	do	do	.....	24	do	do

During the cold period mentioned the Black Minorcas, Andalusians, Plymouth Rocks, Red Caps and the White-Leghorn-Brahma Crosses laid the most eggs. This goes to strengthen the statement made in report of last year "that the breeds which are often stated to be the most unsuitable to cold climates do really lay the best." But if eggs are wanted in winter the laying stock must be kept in a temperature where their combs will not freeze. Better still, if they can be kept where the water will not freeze. It may be said that few farmers have fowl houses wherein the water will not freeze. But the farmers, as a rule, do not give the attention required to make their poultry revenue makers, in winter. When they do, they will find that the same reason and system is required to attain success in this branch, as is demanded by every other. What would be said of the farmer who would give as an excuse for not having potatoes during the winter that he allowed them to stay out until frozen. And how many crops of eggs are lost from the hens standing out until injured by cold. An important point to remember is that, when the laying stock are kept in cold quarters, the food which should go into eggs, goes to keeping up the animal heat. Again, the vegetable food is frozen so that it cannot be eaten, and the droppings remain solid until mild weather permits of their removal. Space will not permit further remarks on the subject, but comfortable quarters for the laying stock are necessary if the farmer wishes to be successful in obtaining eggs at a time when they are highest in price.

Rations for Laying Stock.

The following are the rations for the laying stock :—

Morning Warm Ration.—5 lbs. shorts ; 2½ lbs. pea meal ; 2 lbs. corn meal ; 2 lbs. ground meat ; 2 lbs, oats ; with boiled vegetables occasionally mixed. At times fine ground oyster shells were added.

P. M. Ration.—20, 24 or 26 lbs of wheat.

Vegetables, such as mangels, turnips and carrots were regularly supplied.

This ration was fed to the following stock.

List of Poultry.

The poultry at present on hand numbers :—

Breeds.	Cocks.	Cockerels.	Hens.	Pullets.
Brahmas	1	9	6	16
Red Caps	1	5	5	6
Langshans	1	11	3	8
Plymouth Rocks	1	3	11	9
White Leghorns	1	12	17	12
Wyandottes	1	2	9	6
Buff Cochins	—	2	3	1
Andalusians	2	3	11	7
Black Minorcas	1	13	4	13
Mixed	—	1	29	—
Coloured Dorkings	—	—	3	—
Golden Polands	1	2	3	4
Houdans	—	—	11	1
White Leghorn—Brahma Cross	—	4	—	6
do P. Rock do	—	1	—	1
Black Hamburgs	—	—	4	—
	10	68	119	90
				119
				68
				10
				287
Wild Geese				6
Total				293

Diseases of Poultry.

During the year numerous enquiries were made by letter, and in person, by those living in the neighbourhood, as to numerous ailments from which their stock were suffering. In many cases the symptoms described were difficulty of breathing, clogging of the nostrils, swollen head, emaciation, &c., &c., all of which are symptoms of roup. As has been emphasized in previous reports, in all cases of this disease, it is better to kill the ailing fowl and burn or bury its remains, or the others will surely be contaminated. Roup often follows cold, but is sometimes inherited, and in such cases shows itself first in the weaklings. Often times before the symptoms of the disease are detected, several fowls are suffering from it, and the curing of them is at all times wearisome, and in many cases impossible. It will rarely pay a farmer to attempt to cure a fowl sick with roup, for if he is successful such recovered fowls usually breed poor stock and it is not desirable to raise weakling chickens, or to breed from the same, should they struggle to mature growth.

Summary.

The following summary of information given in previous reports will be useful to those who have not read them :—

Select the best layers for the winter pens.

Supply the layers with bones, oyster shells and vegetables.

Kill the drones for they eat the profit made by the good layers.

Get out as many chickens as possible in time for the early grass.

When properly managed poultry and small fruits are said to be a paying combination.

Keep the layers, if possible, in a temperature where the drinking water will not freeze.

With proper care the cockerels should be fit for market in three to four mouths ; and the pullets become layers in five to six months.

The laying stock should be supplied in winter with all the material necessary for making the eggs.

The best layers will generally be fonnd to be the most active ones.

The Black Minorcas are rapidly coming to the fore as winter layers.

Where the water is kept from freezing, it is of special advantage to the hens with large combs.

In cold poultry houses the food instead of going into eggs goes to keep up the animal heat.

Fowls divided into small colonies lay more eggs than when crowded together.

Keep no layer over two years, for it then moults so late that all future profit is eaten up before it commences to lay.

Intelligent and systematic management is as necessary in the poultry department as it is in every other line of business.

Eggs Different in Colour and Weight.

As large eggs are in demand for shipment it is well to know the difference in the eggs laid by the breeds as named and some of which are among the best known to farmers.

Black Minorcas—Large white eggs—Hen's eggs weighing $2\frac{2}{3}$ to $2\frac{1}{4}$ ozs. each ; per dozen 1 lb. 11 ozs. ; pullet's eggs each 2 ozs.; per doz. 1 lb. 7 ozs.

Andalusians—Large white eggs—Hen's eggs each weighing $2\frac{1}{7}$ to $2\frac{1}{4}$; per doz. 1 lb. 11 ozs.

White Leghorns—Large white eggs—Hen's eggs each $2\frac{1}{4}$; per dozen 1 lb. 10 ozs. to 1 lb. 11 ozs. ; pullet's eggs each $1\frac{9}{10}$ oz.; per dozen 1 lb. $7\frac{7}{8}$ ozs.

Houdans—Large white eggs—Hen's eggs each $2\frac{1}{4}$; per dozen 1 lb. 11 ozs. to 1 lb. 13 ozs.

Brahmas—Large dark coloured eggs—Hen's eggs $2\frac{1}{4}$ to $2\frac{1}{2}$ ozs. each ; per dozen 1 lb $9\frac{1}{2}$ ozs. to 1 lb. 13 ozs.

Buff Cochins—Large dark coloured eggs—Hen's eggs vary in size, some going as high as $2\frac{1}{4}$ ozs., others $1\frac{2}{3}$ each.

Wyandottes—Medium sized dark coloured eggs—Hen's eggs weighing 1 lb. 9 ozs. per dozen; pullet's eggs each 2 ozs.; per dozen 1 lb. 7 ozs.

Plymouth Rocks—Eggs of large or medium size according to strain—Hen's eggs each $2\frac{3}{8}$ ozs.; per dozen 1 lb. 9 ozs. to 1 lb. 11 ozs.; pullet's eggs each 2 ozs.; per dozen, 1 lb. $6\frac{1}{8}$ ozs.

Red Caps—White or lightly coloured eggs of medium size. Single egg, 2 ozs.; per dozen 1 lb. $7\frac{1}{5}$ ozs. to 1 lb. 8 ozs.

Visitors were more numerous during the past than in any previous year. The letters received and the questions asked in them by farmers, have greatly increased in number and indicate growing interest in the poultry department as a means of revenue.

I have the honour to be, sir,

Your obedient servant,

A. G. GILBERT,
Manager Poultry Department.

Central Experimental Farm,
Ottawa, 15th January, 1893.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF W. M. BLAIR, SUPERINTENDENT.

To WILLIAM SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces at Nappan, N.S., during the year 1892.

WHEAT.

The winter of 1891–92 was mild with only a few days sleighing. The spring was dry and cold extending into June, with a very warm and dry July. In consequence of this drouth the roots and vegetables were a light crop, about two-thirds of an average.

Seeding commenced on 21st April, this being the earliest period since we commenced farm work here, and with fine harvest weather, excepting the first week of August, nearly all crops were gathered in good condition.

MANURE.

The barnyard manure available during the past year was supplemented with about 200 dollars worth of special fertilizer, such as superphosphate and ground bone, and in every instance there has been a marked increase of crop where these were applied to the land.

HAY.

Hay on the marsh land was a light crop while that on the upland was heavy; on the former there was about 42 tons of English and 20 tons of Broadleaf, and on the latter there was about 50 tons. This was all secured in good condition.

WHEAT.

Eleven varieties of winter wheat were sown on clover sod ploughed under on plots of one fortieth of an acre each. A statement of the results are given below.

WINTER WHEAT.

Seed sown.	Name.	Date of Sowing.	Harvested.	Yield per acre.	Lbs. per bushel.	Condition when cut.
Lbs				Bush.		
3	Tasmania	Sept. 9	August 1	50	61¾	Long bright straw; some lodged.
3	Canadian Velvet Chaff	do 9	do 6	50	60	Medium straw; some rust.
3	Manchester	do 9	do 5	50	61½	Stiff straw; some rust.
3	Martin's Amber	do 9	do 8	45	60	do do
3	Democrat	do 9	do 5	42½	61½	Stiff bright straw.
3	Golden Cross	do 9	do 1	40	60¾	Stiff red straw.
3	Volunteer	do 9	do 1	40	61	Long red straw; some rust.
3	Early Red Clawson	do 9	do 5	40	60	Stiff bright straw.
3	Royal Red	do 9				Entire failure.
3	White Queen	do 9				do

The Royal Red and White Queen were two varieties imported from England selected as among the best of the many fine sorts recently offered.

Spring Wheat.

Fifteen varieties of spring wheat were sown, as stated below, in plots of one-twentieth of an acre each. Four and one-half pounds of seed was sown on each plot, with the results given.

Names.	Sown.	Harvested	Yield per Acre.	Weight per Bushel.	Condition when cut.
			Bush.	Lbs.	
Rio Grande	April 27..	Aug. 27..	30	60	Long, stiff, bright straw.
White Connell	do 27..	do 29..	35	58¼	Long, stiff straw; some rust.
Gehun	do 27..	.....	.....	.....	.....
Saxonka	do 27..	do 27..	20	59	Medium straw, stiff; very rusty.
Defiance	do 27..	do 27..	25	55	Long, stiff, bright straw.
Campbell's Triumph	do 27..	do 25..	25	59	Medium stiff straw; some rust.
Ladoga	do 27..	do 25..	20	59	Long, stiff straw; some rust.
Pringle's Champlain	do 27..	do 25..	20	58	Long, stiff, bright straw.
Wellman's Fife	do 27..	do 31..	35	57	do do
White Delhi	do 27..	.....	.....	.....	.....
Campbell's White Chaff	do 27..	do 25..	30	56	Long, stiff straw; some rust.
White Russian	do 27..	do 25..	30	58	Long, stiff, bright straw.
Colorado	do 27..	do 22..	35	60	Long, stiff straw; some rust.
Australian	do 27..	do 22..	25	54	do very rusty.
Red Fern	do 27..	do 25..	30	58	Very long, stiff, bright straw.

Barley.

Sixteen varieties of barley were grown in plots of one-twentieth acre each. Four and three-quarter pounds of seed were sown on each plot, with the results stated below.

Names.	Sown.	Harvested	Yield per Acre.	Weight per Bushel.	Condition when cut.
			Bush.	Lbs.	
Duck-bill	April 28..	Aug. 17..	45	49	Medium strong and bright straw.
Rennie's Improved	do 28..	do 8..	50	49	Large, coarse, stiff and bright straw.
Prize Prolific	do 28..	do 17..	50	48½	Short, weak straw; some rust.
Odessa	do 28..	do 8..	60	46	Medium soft straw; bright.
Danish Chevalier	do 28..	do 23..	45	47	Short, soft, bright straw.
Kinver (Webb's)	do 28..	do 23..	25	48	Very short, soft, bright straw.
Oderbruch	do 28..	do 9..	55	48	Medium soft, bright straw; much lodged.
Mensury	do 28..	do 13..	50	45	Medium bright; a little smutty.
Baxter's Six-rowed	do 28..	do 8..	45	47	Medium soft and bright straw.
Goldthorpe	do 28..	do 25..	45	47	Large, bright and soft straw.
Two-rowed Naked	do 28..	do 13..	35	59	Very short, fine straw; some lodged.
Guymalaye	do 28..	do 16..	45	57	Medium coarse, stiff straw; some rust.
Thanet	do 28..	do 16..	55	50	Short, weak straw; much rust.
New Golden Grains	do 28..	do 17..	60	49	Medium weak straw rusty; some lodged.
Saale	do 28..	do 22..	40	50	Medium stiff, straw bright.
Golden Melon	do 28..	do 22..	55	49	do do

Oats.

Thirty-four varieties of oats were also grown in plots of one-twentieth acre each; four and a quarter pounds of seed being sown in each case excepting in that of Rennie's New Oat, on this plot only three pounds of seed was sown from which the following results were obtained :—

Name.	Sown.	Harvested	Yield per Acre.	Weight per Bush.	Condition when cut.
			bush.	lbs.	
Giant Cluster	April 29..	Aug. 29..	75	35	Large, stiff, bright straw.
Abundance	do 29..	do 22..	85	36	do do
Early Etampes	do 29..	do 20..	75	34	Very short, stiff, dark straw.
Prolific California	do 29..	do 20..	65	33	Coarse, stout and bright straw.
Black Brie	do 29..	do 31..	65	36	Large, stiff, bright straw.
Doncaster Prize	do 29..	do 22..	75	35	do do
Improved Ligowo	do 29..	do 17..	75	36	Long, fine, stiff bright straw.
Joanette	do 29..	do 20..	80	35	Short, stiff, bright straw.
American Beauty	do 29..	do 20..	85	35	Long, stiff, bright straw.
Prolific Black Tartarian	do 29..	do 22..	70	35	do do
Victoria Prize	do 29..	do 15..	65	39	Long, bright straw, much lodged.
Rennie's New	do 29..	do 17..	55	34	Very short, stiff, bright straw.
Flying Scotchman	do 29..	do 13..	70	37¼	Long, stiff, bright straw.
Rennies Prize White	do 29..	do 12..	55	40½	Short, stiff, bright straw.
Banner	do 29..	do 20..	60	34¼	Long, stiff, bright straw.
Cream Egyptian	do 29..	do 19	50	41	Long, coarse straw.
English White	do 29..	do 14..	55	40	Medium. soft, bright straw, much lodged.
Early Blossom	do 29..	do 20..	60	37	Long, stiff, bright straw.
White Russian	do 29..	do 23..	70	39	do do
Improved Black Tartarian	do 29..	do 23..	60	37	do do
Holstein Prolific	do 29..	do 23..	85	33	Long, coarse, bright straw.
Challenge (Webb's)	do 29..	do 14..	55	41¼	Short, soft, bright straw; some lodged
Prize Cluster	do 29..	do 16..	40	40	Medium, weak and bright straw; some lodged.
Early Archangel	do 29..	do 17..	55	39½	Stout, strong, bright straw.
Early Gothland	do 29..	do 23..	50	37	Medium, stiff, long, bright straw.
Bonanza	do 29..	do 15..	55	41¾	Long, soft, bright straw; some lodged
New Zealand	do 29..	do 29..	70	36	Large, stiff, bright straw.
Poland White	do 29..	do 16..	60	40½	Long, coarse, soft straw, much lodged
Hazlett's Seizure	do 29..	do 16..	45	40½	Medium, stiff, bright straw.
Rosedale	do 29	do 23..	40	38	Large, bright, stiff straw.
American Triumph	do 29..	do 29..	55	34	Large, soft, bright straw.
Early Racehorse	do 29..	do 15..	60	41	Medium, stiff, bright straw.
Welcome	do 29..	do 16..	65	40	Large, bright, stiff straw.
Canadian Triumph	do 29..	do 15..	65	42	Large, bright, medium stiff straw; lodged.

Early and Late Sowing.

In order to test the relative value of early and late sowing, a field was laid off in plots of one-tenth of an acre each, and sown at six different times, commencing on 27th April, one week intervening between each sowing, the same kind of grain in all cases being sown. There were two plots each of Wheat, Barley and Oats. The following table gives the results :—

Wheat sown at different times.

Nine Pounds on each Plot.	Sown.	Harvested.	Yield per Acre.	Weight per Bushel.
			bush.	
1—Pringle's Champlain	April 27	Aug. 23	30	61
Campbell's White Chaff	do 27	do 23	22½	60
2—Pringle's Champlain	May 4	Aug. 24	27½	60
Campbell's White Chaff	do 4	do 24	20	58
3—Pringle's Champlain	May 11	Aug. 31	22½	59
Campbell's White Chaff	do 11	do 31	17½	55
4—Pringle's Champlain	May 18	Aug. 31	12½	54
Campbell's White Chaff	do 18	do 31	12½	50
5—Pringle's Champlain	May 25	Sept. 2	17½	57
Campbell's White Chaff	do 25	do 2	12½	52
6—Pringle's Champlain	June 1	Sept. 5	10	50
Campbell's White Chaff	do 1	do 5	10	47

Oats sown at different times.

Eight and a-half Pounds on each Plot.	Sown.	Harvested.	Yield per Acre.	Weight per Bushel.
			bush.	
1—Prize Cluster	April 27	Aug. 17	37½	41
Banner	do 27	do 23	67½	37
2—Prize Cluster	May 4	Aug. 19	45	40½
Banner	do 4	do 24	67½	36
3—Prize Cluster	May 11	Aug. 22	42½	39½
Banner	do 11	do 27	75	35
4—Prize Cluster	May 18	Aug. 27	40	35
Banner	do 18	Sept. 1	55	32
5—Prize Cluster	May 25	Aug. 29	32½	38
Banner	do 25	Sept. 3	55	32
6—Prize Cluster	June 1	Aug. 31	35	34
Banner	do 1	Sept. 5	55	30

BARLEY sown at different times.

9½ Pounds of Seed being used on each Plot.	Sown.	Harvested.	Yield per Acre.	Yield per Bushel.
			bush.	
1—Baxter's six-rowed	April 27	Aug. 8	42½	48
Carter's Prize Prolific	do 27	do 15	35	49
2—Baxter's six-rowed	May 4	do 8	42½	49
Carter's Prize Prolific	do 4	do 17	47½	48
3—Baxter's six-rowed	do 11	do 10	55	46
Carter's Prize Prolific	do 11	do 27	42½	45
4—Baxter's six-rowed	do 18	do 18	40	44½
Carter's Prize Prolific	do 18	do 29	50	43
5—Baxter's six-rowed	do 25	do 20	35	41½
Carter's Prize Prolific	do 25	Sept. 3	32½	45
6—Baxter's six-rowed	Jnne 1	Aug. 27	30	40
Carter's Prize Prolific	do 1	Sept. 10	25	46

PEASE.

Twenty-five varieties of pease were sown in small plots, one pound of seed being used in each case, the following were the results obtained:—

Names.	Sown.	Harvested.	Remarks.
Duke of Albany	May 3	Aug. 15	Medium yield.
Telephone	do 3	do 14	Fair yield.
Champion of England	do 3	do 14	do
Steele Bros.' Extra Early	do 3	do 2	Medium good yield.
Extra Early Brittany	do 3	do 12	Good yield.
Laxton's Supreme	do 3	do 12	do
Early Blue Imperial	do 3	do 15	Fair yield.
Ringleader	do 3	do 2	Good yield.
Sratagem	do 3	do 4	Poor yield.
Laxton's Alpha	do 3	do 5	do
First and Best	do 3	do 2	Good yield.
Blue Peter	do 3	do 2	Fair yield.
Horsford's Market Garden	do 3	do 13	Good yield.
American Wonder	do 3	do 2	do
Bliss' Abundance	do 3	do 8	Fair yield.
Kentish Invicta	do 3	do 7	Yielded well.
Extra Early Star	do 3	do 2	Fair yield.
Early Kent	do 3	do 3	do
Tom Thumb	do 3	do 2	Poor yield.
Pride	do 6	do 15	Heavy yield.
Rennie's No. 10	do 6	do 15	Very heavy yield.
Prince Albert	do 6	do 13	Heavy yield.
Mummy	do 6	do 15	do strong growth
White Marrowfat	do 6	do 15	Good yield.
Crown	do 6	do 12	Heavy yield.

Mixed Grain.

Tests conducted for the purpose of ascertaining the results as to quantity and weight of the products from sowing different mixtures of grain, to determine which mixture will give the largest amount of feed per acre.

Seven acres of poor land was selected for the purpose and divided into one acre plots, this land had a dressing of one barrel of Archibald's Fertilizer per acre.

The following table gives the quantity and kinds of seed per acre and the returns:—

Total Number of bush. Sown per acre.	Varieties.	Sown.	Harvested.	Bush. per acre.	Weight per bush.
					Lbs.
2¼	Pease, 1¾ bush. Wheat, ½ do	May 6	August 18	11½	58
2½	Pease, ½ bush. Wheat, 1 do Oats, 1 do	do 6	do 17	19	43½
3	Oats, 1¼ bush. Barley, 1¼ do Pease, ½ do	do 6	do 17	18½	41
3	Oats, 2½ bush. Pease ½ do	do 6	do 18	23½	41
2½	Pease	do 6	do 19	19½	62½
3	Oats	do 6	do 18	26	38½
2¾	Wheat, ¾ bush. Barley, 1 do Oats, 1 do	do 6	do 18	16½	37

Cross-bred Wheats.

Six varieties of cross-bred wheats received from the Central Farm at Ottawa were sown with the following results:—

Amount of Seed Sown.	Varieties.	Sown.	Harvested.	Lbs. per Plot.	Condition when cut.
2 ounces.	Carleton	May 5	August 24	1¾	Long bright weak straw.
2 do	Ottawa	do 5	do 24	2¼	Medium stiff straw, rusty.
2 do	Alpha	do 7	do 24	¾	Long stiff straw, some rust.
2 do	Prince	do 7	do 24	2	Medium stiff straw, rusty.
2 do	Beta	do 7	do 24	1¾	Short stiff straw, rusty.
4 do	Abundance	do 7	do 24	4½	Long stiff straw, rusty.

Turnips.

Fourteen varieties of Turnips were sown on 26th May, consisting of three rows, 30 inches apart and 66 feet long, of each kind. Duplicate plots of the same varieties were sown on 8th June. The following table gives the results :—

Varieties.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot Weight.	2nd Plot Weight.
					Lbs.	Lbs.
Rennie's Prize Purple Top Swede	May 26	June 8	Oct. 18	Oct. 18	500	445
Rennie's Elephant, or Giant King	do 26	do 8	do 18	do 18	340	235
Bangholm Purple Top Swede	do 26	do 8	do 18	do 18	480	470
Carter's Elephant Swede	do 26	do 8	do 18	do 18	380	427
Carter's Prize Winner	do 26	do 8	do 18	do 18	470	470
Sutton's Champion Purple Top	do 26	do 8	do 18	do 18	500	417
Hartley's Bronze Top	do 26	do 8	do 18	do 18	360	330
Mammoth Purple Top	do 26	do 8	do 18	do 18	475	450
Bronze Top Extra	do 26	do 8	do 18	do 18	375	365
Jumbo, or Monarch	do 26	do 8	do 18	do 18	370	325
Steele Bros. Select Purple Top	do 26	do 8	do 18	do 18	430	375
Marquis of Lorne Purple Top	do 26	do 8	do 18	do 18	335	312
Rennie's Novelty Swede		do 8	do 18		450	
Davey's Swede		do 8	do 18		525	

The last named Turnip was from a small quantity of seed kindly sent me by Mr. Davey, the English delegate who visited the farm last year in company with Mr. McQueen. These gave the heaviest crop. He also sent at the same time a small package of mangels, but these latter did not yield as well as some other sorts tried. See Statement of Mangels.

Mangels.

Thirteen varieties of Mangels were sown in plots of three rows each, 66 feet long with 30 inches between each row. These were sown on 26th May, and a duplicate plot of each kind was sown on 8th June, with the following results :—

Varieties.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot Weight.	2nd Plot Weight.
					Lbs.	Lbs.
Pearce's Canadian Giant	May 26	June 8	Oct. 17	Oct. 17	420	495
Carter's Warden Prize Yellow Globe	do 26	do 8	do 17	do 17	335	355
Mammoth Long Red	do 26	do 8	do 17	do 17	495	465
Gate Post or Long Red	do 26	do 8	do 17	do 17	270	265
New Giant Yellow Intermediate	do 26	do 8	do 17	do 17	512	385
Golden Fleshed Tankard	do 26	do 8	do 17	do 17	335	270
Red Fleshed Tankard	do 26	do 8	do 17	do 17	175	190
Red Globe	do 26	do 8	do 17	do 17	329	330
Berkshire Prize	do 26	do 8	do 17	do 17	300	220
Red Globe Oberndorff Extra	do 26	do 8	do 17	do 17	250	220
Rennie's Mammoth Long Red	do 26	do 8	do 17	do 17	367	325
Yellow Globe Select	do 26	do 8	do 17	do 17	280	187
Yellow Globe (Davey's)	June 8		do 17		300	

Carrots.

Twelve varieties of carrots were sown on 27th May in three rows 66 feet long, and 24 inches between the rows, with duplicate plots of each sown on 8th June. The results are stated below :—

Varieties.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	1st Plot Weight.	2nd Plot Weight.
					Lbs.	Lbs.
Guerande or Oxheart	May 27..	June 8..	Oct. 14..	Oct. 14..	455	277
Improved Short White	do 27..	do 8..	do 14..	do 14..	395	30
Giant White Belgian	do 27..	do 8..	do 14..	do 14..	475	280
Manitoba White Intermediate	do 27..	do 8..	do 14..	do 14..	500	350
Danver's Orange	do 27..	do 8..	do 14..	do 14..	375	140
Carter's Orange Giant	do 27..	do 8..	do 15..	do 15..	325	240
Pearce's Improved Half Long White	do 27..	do 8..	do 15..	do 15..	350	300
Giant Short White Vosges	do 27..	do 8..	do 15..	do 15..	400	215
Mammoth Smooth White	do 27..	do 8..	do 15..	do 15..	470	295
Early Gem	do 27..	do 8..	do 15..	do 15..	415	315
Chantenay	do 27..	do 8..	do 15..	do 15..	395	290
Iverson's Champion White	do 27..	do 8..	do 15..	do 15..	485	280

Sugar Beets.

Four varieties of sugar beets were sown in 3 rows, each 66 feet long and 30 inches between the rows with the results given below :—

Varieties.	Sown.	Pulled.	Weight of Plot.
			Lbs.
Brabant	May 27..	Oct. 19..	132
Kruger	do 27..	do 19..	113½
Klien Wanzleben	do 27..	do 19..	225
Vilmorin's Improved	do 27..	do 19..	118½

Potatoes.

Forty-six varieties of potatoes were planted in 2 rows, each 66 feet long. Date of planting, character of growth and yield are given below :—

Varieties.	Planted.	Dug.	Sound.	Rotten.	Remarks.
			Lbs.	Lbs.	
Rural Blush	May 27	Sept. 20	93	.....	Growth strong ; medium tuber ; late.
Chicago Market	do 27	do 20	74	11	Growth medium ; long tuber ; late.
Brownell's Winner	do 27	do 20	77	8	Growth strong ; medium long tuber ; late.
Halton Seedling	do 27	do 20	72	13	Growth weak ; small round tubers ; early.
Thorburn	do 27	do 20	110	17	Growth weak ; medium smooth tuber ; late.
Early Rose	do 27	do 19	107	17	Growth weak ; medium tubers ; early.
Algoma	do 27	do 19	102	11½	Growth weak ; medium tubers ; early.
Richter's Schneerose	do 27	do 20	120	.... .	Growth strong ; large, round tubers ; late.
Early Eating	do 27	do 19	61	....	Growth weak ; small round tubers ; late.
White Star	do 27	do 20	99	.....	Growth weak ; small round smooth tubers ; early.
Beauty of Hebron	do 27	do 19	115	11	Growth strong ; medium tubers ; early.
Rose's New Giant	do 27	do 19	83	4	Growth strong ; long large tubers ; late
Clarke's No. 1	do 27	do 20	85	10	Growth strong ; medium long smooth tubers ; late.
Stray Beauty	do 27	do 19	161	.....	Growth strong ; large medium tubers ; early.
London	do 27	do 19	114	10	Growth weak ; medium tubers ; early.
Crown Jewel	do 27	do 20	71	20	Growth strong : round tubers ; early.
Acadian	do 27	do 19	101	.....	Growth strong ; large flat tubers ; late.
Lee's Favourite	do 27	do 19	110	18	Growth weak ; medium tubers ; early.
Early Maine	do 27	do 19	83	.....	Growth weak ; small tubers ; early.
Rural New Yorker No. 2	do 27	do 20	67	. ....	Growth strong ; long round smooth tubers ; late.
Richter's Improved	do 27	do 20	93	.... .	Growth strong ; medium smooth tubers ; late.
Wonder of the World	do 27	do 20	90	.....	Growth weak ; long flat smooth tubers ; late.
Burbank Seedling	do 27	do 20	93	4	Growth weak ; long round smooth tubers ; late.
King of Earlies	do 27	do 20	45	.....	Growth strong ; small round tubers ; late.
Delaware	do 27	do 20	113	.....	Growth strong ; large round tubers ; late.
Early Puritan	do 27	do 19	122	.....	Growth strong ; long tubers ; late.
Great Eastern	do 27	do 19	104	13	Growth strong ; long round tubers ; late.
Conqueror	do 27	do 20	86	4	Growth strong ; round smooth tubers ; late.
Scherburn's Late Rose	do 27	do 19	99	14	Growth medium ; small tubers ; late.
Mammoth Prolific	do 27	do 19	79	2	Growth strong ; medium tubers ; late.
Early Callao	do 27	do 20	60½	.....	Growth strong ; small round tubers ; early.
Centennial	do 27	do 20	76	.....	Growth strong ; large round tubers ; late.
Late Goodrich	do 27	do 20	76	.....	Growth strong ; small round tubers ; late.
Compton's Surprise	do 27	do 20	117	.....	Growth strong ; large rounds smooth tubers ; late.
Muchonic	do 27	do 20	102	.....	Growth strong ; large round tubers ; late.
Large Callao	do 27	do 20	56	7	Growth weak ; small round tubers ; late.
Black Montana	do 27	do 20	93	.....	Growth medium ; large round tubers ; late.
Richter's Elegant	do 27	do 20	143	.....	Growth strong ; long pink tubers ; early.
Rosy Morn	do 27	do 20	109	12	Growth strong ; medium tubers ; early.
Empire State	do 27	do 20	66	.... .	Growth strong ; large smooth tubers ; late.
Silver Dollar	do 27	do 20	111½	6	Growth strong ; medium tubers ; late.
Early Sunrise	do 27	do 19	118	10	Growth strong ; large smooth tubers ; early.
Sugar	do 27	do 19	73	4	Growth medium . small round tubers ; late.
Dakota Red	do 27	do 20	92	6	Growth strong ; large round smooth tubers ; late.

Flax.

Two plots of flax were sown, Russian and White; the latter was a failure; the former gave 12 bushels per acre, and was found to be a valuable food for calves and horses, either scalded with hot water and mixed with feed, or ground and mixed.

Vetches.

A plot of White Vetches were sown for seed, with the following results—the land was poor and weedy:—30 lbs. of seed sown 6th May, harvested 15th August, gave 6 bushels. Weight per bushel, 62¾ lbs.

Buckwheat.

Two varieties of buckwheat were sown, with the following results:—

Varieties.	Sown.	Harvested	Remarks.
Silver Hull	June 9..	Sept. 2..	7 bush. sown; 54 bush. harvested.
Japan	do 9..	do 2..	10 lbs. sown; 3½ do

Millet.

Nine varieties of millet were sown, and also one of Canary seed. The former did fairly well. The canary seed grew and ripened well, and appears to be well adapted to this climate. The following are the results:—

Varieties.	Sown.	Harvested	Remarks.
Hungarian Millet	May 30..	Sept. 29..	Fair growth; filled out medium well.
Branching do	do 30..	do 29..	Strong growth; filled out well.
Round White Millet	do 30..	do 29..	Weak growth; filled out fairly well.
California Green Millet	do 31..	do 29..	Weak growth.
Red Millet	do 31..	do 15..	do filled out and ripened well.
Choice Round White Millet	do 31..	do 15..	Strong growth do do
Italian Millet	do 30..	Oct. 3..	Very strong growth; not filled out.
Black Millet	do 30..	Sept. 15..	Strong growth; filled out and ripened well.
Golden Wonder	do 30..	Oct. 3..	Very strong growth; poorly filled out.
Canary Seed	do 31..	Sept. 15..	Medium strong growth; filled out well.

Sunflowers.

A plot of sunflowers were sown, which made a strong growth and ripened well Sown 8th June, harvested 12th October.

Corn.

Thirteen varieties of corn were sown in two rows each, in hills three feet apart each way and 66 feet long, with the results as given below :—

Varieties.	Sown.	Harvested.	Weight per plot.	Remarks.
			Lbs.	
Smut Nose Flint	June 7	Sept. 26	230	Tasselled, Aug. 26 ; silked, Sept. 10 ; in late milk, Sept. 26.
Mammoth Sweet	do 7	do 28	420	Tasselled, Sept. 20 ; silked, Sept. 28 ; ears just forming.
Red Cob Ensilage	do 7	do 28	450	Tasselled, Sept. 24 ; no silk ; no ears.
Angel of Midnight	do 7	do 26	280	Tasselled, Aug. 22 ; silked, Aug. 30 ; soft glazed, Sept. 26.
Longfellow	do 7	do 26	195	Tasselled, Sept. 5 ; silked, Sept. 25 ; in late milk, Sept. 26.
Pride of the North	do 7	do 26	265	Tasselled, Sept. 2 ; silked, Sept. 15 ; in early milk, Sept. 26.
Crosby's Early Sugar	do 7	do 26	200	Tasselled, Sept. 2 ; silked, Sept. 22 ; soft glazed, Sept. 26.
Mitchell's Extra Early	do 7	do 26	50	Tasselled, Aug. 2 ; silked, Aug. 22 ; hard glazed, Sept. 26.
Mammoth Southern Sweet	do 7	do 28	440	Tasselled, Sept. 24 ; silked, Sept. 28 ; no ears.
Thoroughbred White Flint	do 7	do 28	280	do Sept. 17 do do 28 do
Cinquantine	do 7	do 26	80	do Aug. 20 do do 2 ; hard glazed, Sept. 26.
North Dakota	do 7	do 26	195	Tasselled, Aug. 30 ; silked, Sept. 13 ; in early milk, Sept. 26.
Pearce's Prolific	do 7	do 26	280	Tasselled, Sept. 1 ; silked, Sept. 22 ; soft glazed, Sept. 26.

There was also planted one acre of corn in hills three feet apart each way, one half of this was planted with Pearce's Prolific and one half with Longfellow. This acre gave 19,730 lbs of corn well wilted.

Another acre was planted in rows three feet apart and thinned out to 5 and 6 inches between the plants, one half being planted with Pearce's Prolific, the other half with Longfellow as above, this acre gave 25,770 lbs of corn well wilted.

Bordeaux Mixture for the Prevention of Potato Rot.

A thorough test was made of the Bordeaux Mixture as applied to potatoes for the prevention of rot, the first application was made on July 25th and the second on August 25th. For this purpose a plot consisting of five varieties, embracing both early and late kinds was selected. This plot was divided across the middle ; one half was treated and the other was left untreated.

This mixture is made by dissolving 3 pounds of Blue Stone, in eleven gallons of water, and slacking 2 pounds of Lime in water and after it is well slacked strain out the coarser particles through a coarse cloth and mix the creamy fluid with the other liquid, —a thin salt bag makes a good strainer,—this is applied with a sprayer to the plants when they are about one foot high, and again just about ten days or a fortnight later. The plants so treated kept green until the frost struck them, while the others not treated withered and dried up. The whole plot was treated with Paris green twice for the prevention of the potato bug. The weight of tubers both rotted and sound are given below

	Names.	Treated with Bordeaux Mixture.		Not Treated.	
		Sound.	Rotted.	Sound.	Rotted.
Oct. 8	Early Sunrise	115 lbs.	0 lbs.	118 lbs.	30 lbs.
do 8	Acadian	180 do	0 lbs.	194 lbs.	13 lbs.
do 8	Muchonic	283 do	0 lbs.	272 lbs.	13½ lbs.
do 8	Sugar	119½ do	0 lbs.	79½ lbs.	8 lbs.
do 8	Dakota Red	191 do	0 lbs.	133 lbs.	2 lbs.

Beans.

Nineteen varieties of beans were planted in small plots, the date of planting and harvesting and character of growth is stated below. The Early Mazagan proved to be a much better variety than the Broad Windsor, being a larger cropper and earlier.

Varieties.	Sown.	Harvested.	Condition when Picked.
Giant Red Wax	June 8..	Sept. 30.	Growth poor ; very few ripe.
Henderson's Bush Lima	do 8..	do 30..	do medium ; none ripe.
Black Wax	do 8..	do 30..	do medium ; none ripe ; good early table variety.
Crystal White Wax	do 8..	do 30..	do medium ; very few ripe.
Yellow Six Weeks	do 8..	do 30..	do strong ; all ripe ; second best cropper.
Early Garden Cluster Wax	do 8..	do 30..	do strong ; none ripe ; best early table variety.
Dwarf German Black Wax	do 8..	do 30..	do medium ; one half ripe ; good cropper.
Cranberry	do 8..	.....	Very poor.
Yosemite Mammoth Wax	do 8..	Sept. 30..	Growth medium ; none ripe.
Dwarf German White Wax	do 8..	do 30..	do medium ; nearly all ripe ; good cropper.
Mammoth Red German Wax	do 8..	do 30..	do medium ; one half ripe.
Broad Windsor	do 8..	Oct. 12..	do strong ; none ripe.
Red Speckled	do 8..	.....	Very poor.
Flageolet Wax	do 8..	.....	do
Royal Dwarf Kidney	do 8..	Sept. 30..	Growth medium ; one half ripe ; good cropper.
Early Dun Coloured	do 8..	do 30..	do strong ; all ripe ; best cropper.
Early Mazagan	do 8..	Oct. 12..	do very strong ; some ripe.
Canadian Wonder	do 8..	Sept. 30..	do medium ; few ripe.
Golden Andalusian Wax	do 8..	.....	Very poor.

The beans and pease are not taken into consideration in general statement of quantity of grain.

General Statement of Crops.

In addition to the plots of grain already referred to which gave 451 bushels, there were 11 acres in oats which gave 499½ bushels, and 4 acres in buckwheat that gave 54 bushels of grain, and in addition to the plots of roots already mentioned there were 4 acres in turnips which yielded 2,820 bushels, making in all, including plots of roots, about 3,920 bushels. There was also 2 acres devoted to green crop for summer feed for cattle, and 3 acres to small fruits, grasses and forest trees.

Nine acres of land was underdrained this year, making in all 69 acres of the farm now drained. All the drains are proving satisfactory.

Road making has also been carried on this year, as time from other work would permit.

Buildings.

Three new buildings have been erected this year, one for swine, another for storing carts, waggons, implements and tools of all kinds, one end of which is fitted up for poultry, with roomy yards adjoining. A part of the third building is used for light carriages, sleighs, harness, etc., and a part for a workshop which is very useful in stormy weather for cleaning harness, sorting and cleaning grain, etc. The upper story of this building is used as a store room for samples of grain, etc.

These buildings were much needed and are very convenient, and with the additional accommodation they have given we have been able to remove the remaining old buildings previously used for storing purposes.

Water Supply.

The system of water supply has been completed, and so far has proved satisfactory This was accomplished by digging a large well on the higher upland some 2,000 feet from the buildings and stoning it up. Into this well the water from several small springs near by was conducted by means of tile. The water from this well, which is 25 feet above the barnyard level, is carried by a 1¼ inch galvanized iron pipe to the barn and stable, with ½ inch pipe in the dwelling house. Thus far the supply of water has been ample and continuous.

Cattle.

The cattle bought last year for fattening purposes were sold in April for the St. John, N.B., market.

No steers have been purchased this year to fatten, but some experiments are being carried on in feeding a few yearlings of different grades raised on the farm. With a few exceptions the cows have done well and there is a good increase of promising young stock.

Ornamental Trees and Shrubs.

The trees and shrubbery planted last year with a few exceptions came through the winter well and made a good growth this season. Those that failed were replaced in the spring, and when the fall came were strong and healthy.

The young forest trees in the nursery are growing rapidly, especially the Manitoba Maple or Box Elder, many of which are now 2½ feet high, from seed planted in May, 1891.

Small Fruits.

All the small fruits did well this year. Insects were rather troublesome, but constant attention with hellebore has kept them in check.

Fruit Trees.

The young orchard of apple trees is doing well, a few trees had to be replaced this year also some of the plums and pears that died during last winter.

The orchard has been extended by the addition of apple, plum, cherry and pear trees which, with a small addition the coming spring, will fill the ground at present allotted for orchard purposes. Some of the trees produced fruit this season, and all made a good strong growth. The Wagener, Scott's Winter, Jonathan, Haas, Maiden's Blush, Tetofsky and Longfield gave some good specimens. The Longfield produced a heavy crop, so much so that much of the fruit, when forming, had to be picked off, even then the limbs in some instances broke under the weight of apples; the limbs are long and slender and the wood appears to be soft.

Exhibitions.

Some of the products of the farm was shown at New Glasgow and Sackville exhibitions. The exhibit consisted of grain in straw and bottles, and also potatoes. A large collection has been arranged for the Chicago exposition, consisting of grain in straw and in bags. A large quantity of roots and vegetables, partly the growth of the Experimental Farm and partly collected from farmers in Nova Scotia and New Brunswick, has been shipped to Chicago. Four hundred and nineteen sample bags of grain and potatoes were distributed among farmers for test from here during the year.

Meetings Attended.

I attended the annual meetings of the New Brunswick Farmers and Dairyman's Association, at Fredericton, on March 24 and 25; also the Dairyman's Association, at Amherst, on 29th and 30th of March; a public meeting, at Amherst, on 4th April; a farmers' meeting at Pugwash, on April 8, one at Wallace, on April 9; also attended a meeting of farmers at River John, Pictou county, on 28th and 29th of June, and two meetings of farmers in Cumberland county, during the year.

I have the honour to be, sir,

Your obedient servant,

W. M. BLAIR,
Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., 24th December, 1892.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR.—I submit herewith my fifth annual report of the experiments undertaken and the work accomplished on the Brandon Experimental Farm during 1892. Although five small plots of grain were sown on this farm on the 6th of April, seeding was not general until the 14th of that month, or fully a week later than the average season. On the 26th of April, after nearly all the wheat was sown here the weather again turned cold, and heavy snow fell, delaying further seeding until 7th May, from that date until the end of June the weather was favourable and growth rapid. On 30th June the thermometer dropped to 3 below freezing, injuring many of the tender vegetables, and discolouring the blades of oats and wheat. This frost, and the following two weeks of excessive dry weather is no doubt answerable for the shortness of straw so general throughout the northern and central parts of the province. From the 15th July to 20th August the weather was in every respect favourable to the growing crops, but from the 20th to the 29th of that month it was excessively hot, so much so that the ripening grain had not sufficient time to fill properly, and much of it, especially that on poorly farmed, weedy land produced a small yield and a shrunken kernel. Frost sufficient to injure grain was not experienced on this farm until 13th September, when all but two plots were harvested. Although the yield of grain throughout the province this year is below the average, the quality is excellent, and millers agree that the sample, though small in the berry, is the best milling wheat grown here for years. The returns per acre on the Experimental Farm during the past year were not equal to that of 1891, still the yields are fair, and the almost total absence of injury from wind or frost makes the year one of the most successful for experimental purposes since the farm was established.

In accordance with your instructions that the work of the farm should as much as possible follow certain lines each year, and a considerable area of land on the farm being in excellent condition this spring for the accurate testing of varieties of grain, special attention has been paid to this, and some other portions of the work curtailed. During the year a total of 169 plots have been sown with wheat, with oats 102, and 86 plots with barley, field pease, &c. The season being particularly free from storms and injurious frosts, a large amount of reliable data has been obtained regarding the numerous varieties tested. Having now the results of tests made during three seasons, I would suggest that the sowing of a large number of the least promising of the varieties be discontinued, and that special attention be paid to the cross-bred sorts originated on the several Experimental Farms, and to any other new varieties that may be obtained.

WHEAT.

As usual this cereal has received a large share of attention, no less than 103 plots being devoted to a test of different varieties. Having three distinct characters of soil available and in excellent condition for wheat, a number of the most promising sorts were sown in triplicate—one series of plots being in the south-east corner of the valley portion of the farm on stiff clay loam, similar to much of the land found in the Red

River valley, the second series were sown on rich black loam of somewhat lighter character, while the third series were on upland prairie, soil a gravelly loam. The soil chosen for the first two series was remarkably uniform, and the results therefore may be regarded as reliable, the upland, although selected with every care, was slightly undulating, and for that reason was not quite uniform in character.

The following varieties of wheat were grown here for the first time this year, and a slight description of them may prove useful.

Emporium, a heavily bearded wheat, is similar in appearance to the Eureka and Red Fern, and as these three varieties of wheat mature in the same number of days and yield about the same, they are no doubt identical.

Goose Wheat is a variety well known in Ontario, but is not generally grown here, it is a bearded wheat with a large heavy head; it matures altogether too late for this country, and should it ripen in a favourable season, the quality of the grain would make it objectionable.

Democrat Spring is somewhat similar to Goose Wheat, and like it of doubtful quality and late in maturing.

Black Sea is a long strawed bearded wheat, five days earlier than Red Fife, but has not equaled it in productiveness; being early, it should, however, be tested another season.

Bearded Red is a stiff-strawed bearded variety, not at all productive this year; it is early and should be given another trial.

Test of Varieties of Wheats on Clay Loam.

Varieties of wheat sown on stiff clay loam April 20; first crop after breaking, sown with common drill seven pecks per acre; bluestoned 1 lb. to 10 bushels; no smut or rust on any of the varieties; size of plots, one-fifth acre.

Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight per Bushel.	Ripe.	Days in maturing.	Yield per Acre.	
	Inch.		Inch.		Lbs.			Bush.	lbs.
Green Mountain	35	Stiff	3	Bald	60½	Aug. 29	131	41	15
Red Fife	45	do	3½	do	61	do 30	132	40	32
Hungarian Mountain	42	do	3¾	do	60½	do 29	131	40	10
White Fife	43½	do	3½	do	60	do 29	131	38	20
White Connell	40	do	3½	do	59½	do 29	131	38	5
Old Red River	39	do	.....	do	59½	do 30	132	38	20
Colorado	39	do	3	Bearded	62	do 22	124	37	55
Ladoga	42	do	3	do	58	do 18	120	36	20
Red Connell	43	do	3½	Bald	60	do 29	131	34	15
Wellman's Fife	48	Fair	4	do	60¼	do 29	131	31	55
Campbell's White Chaff	35	Stiff	3½	do	60	do 27	126	31	50
Eureka	41	do	4	Bearded	60	do 24	126	31	40
Emporium	39	do	4	do	58	do 24	126	31	5
Golden Drop	40	Fair	2½	Bald	60	do 24	126	30	50
Blue Stem	44	Stiff	4	do	60	do 30	132	30	5
White Russian	42	Fair	4	do	59	do 30	132	29	..
Carter's F	47	Weak	4½	do	56	Sept. 1st	134	25	50
Hard Red Calcutta	25	Fair	2½	Bearded	61½	Aug. 10	112	17	45

Note.—The weights per bushel given here, and also with all other grain tables in my report, are not the maximum weights that the grain could be brought to, but were taken from grain cleaned to a condition fit for milling purposes only.

Test of Varieties of Wheat on Black Loam.

Results of wheat tests sown on black loam in the valley, on April 22nd, land summer-fallowed the previous year, sown with Press Drill, six pecks per acre, bluestoned no smut, Blue Stem, Australian and Carters I slightly rusted, balance free from rust, size of plots one tenth of an acre.

Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight per Bushel.	Ripe.	Number of days Maturing.	Yield per Acre.	
	Inch.		Inch.		Lbs.			Bush.	Lbs.
White Connell	40	Stiff	3	Bald	60½	Aug. 28	128	38	
White Fife	40	do	4	do	60½	do 28	128	38	
Pringle's Champlain	37	do	3	Bearded	61	do 22	122	38	
Red Fife	39	do	3	Bald	59	do 30	130	37	50
Hungarian Mountain	42	do	3½	do	60½	do 29	129	37	50
Blue Stem	43	do	4	do	59½	Sept. 2	133	34	20
Old Red River	38½	do	3	do	60	Aug. 25	125	33	20
Colorado	39	do	3	Bearded	60	do 23	123	33	20
Club	38	do	3	Bald	60	do 24	124	33	10
Assiniboine	47	Very weak	3	Bearded	61	do 22	122	32	10
Waugh's Delhi	36	Stiff	1½	Bald	58½	do 24	124	32	10
Green Mountain	38	do	3	do	61½	do 25	125	32	
Carters F	44	Weak	5	do	56	Sept. 3	134	31	30
Nameless	48	Stiff	6½	Bearded	60½	Aug. 25	125	31	
Defiance	41	do	3	Bald	60	do 24	124	30	40
Eureka or Red Fern	46	do	3½	Bearded	58	do 26	126	30	20
Campbell's White Chaff	35	do	3	Bald	60	do 27	127	30	10
Johnston's	38	do	4	do	55	do 26	126	30	10
Kent	38	do	2½	do	59	do 24	124	30	
Emporium	45	Stiff	3½	Bearded	58	Aug. 26	126	29	40
Ladoga	38	do	3	do	58	do 24	124	28	50
White Russian	40	do	3½	Bald	58½	do 29	129	28	30
French Imperial	47	do	3½	do	61	do 26	126	27	50
Wellman's Fife	41	Fair	4½	do	61	do 28	128	26	40
Chilian White	43	Stiff	3	Bearded	60	do 24	124	26	10
Carters I	48	Very weak	3½	Bald	55	do 30	130	25	50
Red Connell	38	Stiff	3	do	59	do 26	126	23	50
Indian Karachi	27	do	2		59	do 20	120	22	40
Campbell's Triumph	40	do	2½	Bald	60½	do 24	124	20	50
Golden Drop	40	do	3	do	60	do 25	125	20	00
White Delhi	19	do	2	Mixed	58½	Ag. 15 to 24		20	00
Gehun	27	do	2	Bald	60	Aug. 20	120	17	50
Club Bombay	20	do	2	Bearded	61	do 15	115	16	40
Hard Red Calcutta	28	do	2½	do	61½	Aug. 10	110	14	40

Test of Varieties of Wheats on Upland Prairie.

Test of 31 varieties of wheat, sown on upland prairie, April 25th, soil light loam, summer fallow, sown with common drill seven pecks per acre, all bluestoned, no smut, Black Sea, Carters F, Goose and Gehun slightly rusted, balance free from rust.

Variety.	Length of straw.	Character of straw.	Length of head.	Kind of head.	Weight per bushel.	Ripe.	Days in maturing.	Yield per acre.	
	Inch.		Inch.		Lbs.			Bush.	Lbs.
Defiance	33	Stiff	3	Bald	55	Aug. 26	123	28	30
Blue Stem	43	do	3½	do	58	do 27	124	26	50
Red Connell	36	do	3	do	59	do 26	123	26	40
Campbell's W. Chaff	37	do	6	do	60	do 24	121	25	50
Old Red River	33	do	3½	do	55	do 26	123	25	50
Club	32½	do	3	do	59	do 26	123	25	10
Hungarian Mountain	33	do	3	do	55½	do 26	123	24	54
White Connell	36	do	3½	do	61½	do 25	122	24	40
Red Fife	35	do	3½	do	60	do 27	124	24	30
Democrat Spring	40	Fair		Bearded	61	Sept. 17	145	24	30
Carters F	39	Stiff	4	Bald	53	Aug. 27	124	24	22
Waugh's Delhi	38	do	2	do	59	do 22	119	24	10
White Fife	36	do	3½	do	60	do 26	123	23	10
Johnston's	36	do	3	do	57	do 26	123	22	30
Goose	43	do	3½	Bearded	60	Sept. 7	135	21	52
Campbell's Triumph	31	do	3	Bald	53	Aug. 26	123	21	50
Summer Cob	38	do	3½	do	59	do 26	123	21	40
Black Sea	40	do	6	Bearded	61½	do 22	119	20	10
Onega	31	do	3	do	59	do 19	116	20	
Ladoga	38	do	3	do	60½	do 20	117	19	40
Wellman's Fife	33	do	3½	Bald	59	do 26	123	19	30
Chilian White	32	Fair		Bearded	60	do 25	122	19	10
Great Western	35	do	4	do	62	do 23	120	18	40
Karachi	29	Stiff	3		54	do 18	115	18	20
White Delhi	19	Fair	3	Mixed	50	do 18	115	18	10
Russian Hard Tag	28	do	4	Bearded	61½	do 22	119	18	10
Bearded Red	38	Stiff	4	do	60	do 22	119	15	30
Gehun	23	Crinkled	4	Mixed	62	do 18	115	15	20
Soft Red Calcutta	23	Stiff	3	Bearded	62½	do 19	116	12	30
Hard Red Calcutta	27	Fair	4	do	59	do 19	116	12	
Club Bombay	19	Stiff	3	do	62	do 19	116	9	10

Cross-bred Wheats.

Five cross-bred wheats, originated at the Central Experimental Farm, Ottawa, have been tested here during the year, the amount of seed was only sufficient to sow a plot of each variety eleven feet square; for that reason the yield per acre has not been given. Alpha, Carleton and Prince have been obtained by crossing Ladoga, female, with White Fife, male, Ottawa and Beta from Ladoga, female, with Red Fife, male.

For comparison an adjoining plot was sown with Red Fife at the same time.

The dates of ripening are given as closely as could be ascertained with such small plots, for owing to the large proportion of outside edge it is always difficult to get reliable dates of ripening from such small areas, The Alpha gave the best sample of grain, it is somewhat longer in the berry than the Red Fife and is quite clear and hard. All were sown on May 16th.

Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Rust.	Smut.	Ripe.	Yield per Plot.
Alpha	31 inches.	Stiff.	3 inches.	bald	None.	None.	Aug. 25	3 lbs. 9 oz.
Ottawa	36 do	do	3½ do	bearded	do	do	do 22	3 lbs. 3 oz.
Carleton	30 do	do	2½ do	do	do	do	do 26	1 lb. 15 oz.
Prince	32 do	do	3½ do	do	do	do	do 27	1 lb. 14 oz.
Beta	31 do	do	3 do	do	do	do	do 26	1 lb. 7 oz.
Red Fife	32 do	do	3½ do	bald	do	do	Sept 4	3 lbs. 7 oz.

The use of Barnyard Manure in Growing Wheat.

The impression is generally prevalent throughout the province that the use of barnyard manure has the effect of causing a rank growth of straw and thereby delaying the ripening of the crop. So general is this impression that many farmers avoid using manure and thousands of loads of manure are either burnt or deposited on the ice of our rivers to be carried away in spring. To test this question three plots of one-tenth acre each were selected, two of these were treated with manure and the third plot sown without manure, below will be found particulars of this experiment.

Red Fife sown with Press Drill on wheat stubble, ploughed in spring, soil gravelly loam.

Variety.	When Sown.	How treated.	Length of Straw.	Ripe.	Yield per Acre.
Red Fife	April 25..	Fresh manure 20 tons per acre...	31 inches..	Aug. 19...	20·50 bush.
do	do 25..	Rotted do do ...	29 do ..	do 19...	21·10 do
do	do 25..	No manure	31 do ..	do 24...	20·40 do

It will be seen from the above :—

1st. That the plots treated with manure gave slightly the largest yield of grain but no longer straw.

2nd. That both of the manured plots ripened five days earlier than the unmanured. This experiment should be repeated for a number of years on varying soils, and if it is found that the use of manure generally hastens the ripening of grain it will be a great inducement for farmers to go more extensively into mixed husbandry, and to utilize all stable manure produced on the farm.

Results from the application of Superphosphate of Lime and Salt to Wheat.

At the request of the Manitoba Central Farmers' Institute a test was made during the past season with superphosphate of lime and salt applied to wheat with the object of hastening maturity.

The land selected was in wheat the previous year, and was ploughed and harrowed in the fall, the superphosphate and salt were sown broadcast after the grain was well up; the weather was very dry when the fertilizers were applied, and no rain fell for some time afterwards; the season was therefore unfavourable for the experiment. This will require to be repeated a number of times before any reliable conclusion can be reached.

It will be seen that the returns were largest from the plots treated with salt, and the smaller amount of superphosphate, the date of ripening was not affected by the chemicals.

How Treated.	Variety.	Length of Straw.	Weight per Bushel.	Ripe.	Yield per Acre.
		Inches.	Lbs.		Bush. Lbs.
Superphosphate, 250 lbs. per acre	Red-Fife ...	31	61	Aug. 20....	18 40
do 500 do	do	30	60	do 20....	16 30
Salt, 250 lbs. per acre	do	30	60½	do 20 . .	18 20
Untreated	do	28	60	do 20....	16 30
Light harrowed twice	do	28	60½	do 20....	17 20
Iron harrowed once	do	33	60	do 20....	17 00
Not harrowed	do	31	59½	do 20....	16 50

A Test of Rolling Wheat Land.

It is seldom advisable to roll land here directly after sowing as it increases the risk of injury from wind storms, but many think the yield is increased if the grain is rolled when a few inches high, and it certainly levels the ground for harvesting.

This year three plots of wheat stubble land; ploughed in the fall were devoted to testing this matter.

The rolling was done with a heavily loaded iron land roller after the wheat had reached six inches high and when the surface soil was dry. None of the plots were injured by wind.

By the following tables it will be seen that land once rolled gave a slightly larger return followed by the unrolled, while the plot rolled twice gave the smallest yield: this result being somewhat contradictory the experiment should be repeated another year.

How Treated.	Variety.	Length of Straw.	Weight per Bushel.	Ripe.	Yield per acre.	
					Bush.	Lbs.
Rolled once	Red Fife	34 inches	60½ lbs	August 20	17	30
Rolled twice	do	36 do	60½ do	do	16	..
Unrolled	do	28 do	60 do	do	16	30

Spring and Fall Ploughing versus Summer Fallow.

The rain-fall of the past season being somewhat below the average was favourable to wheat on summer-fallow and spring ploughing, this result is to be generally expected in this Province and no farmer should depend altogether on fall ploughing; for land worked at that season is in such a loose condition when winter sets in that a large proportion of its moisture is evaporated before Spring and the grain suffers in consequence.

Following this will be found particulars of this year's test of the above modes of preparing land.

The summer fallow was ploughed once on 22nd June, and the weeds kept down during summer by the use of a three horse cultivator.

The fall ploughed plot was harrowed as soon as ploughed and again harrowed in Spring.

The Spring ploughed plot was sown as soon as ploughed, thus promptly retaining the moisture and starting germination.

How Treated.	Sown.	Variety.	Length of Straw.	Weight per Bushel.	Ripe.	Yield per acre.	
						Bush.	Lbs.
Spring Ploughing	April 22	Red Fife	31 inches	61 lbs	August 20	28	10
Fall Ploughing	do	do	31 do	59½ do	do	16	50
Summer Fallow	do	do	39 do	59 do	August 30	38	20

Drill Tests with Wheat.

Besides the usual tests of different kinds of machines for sowing grain, two plots were devoted to comparing results with chain coverers against press wheels. The work was done equally well by both coverers—neither plot suffered from wind storms—and it will be noticed that there was only a difference of 10 lbs. per acre in the yields.

It is generally thought that the press drill as now constructed makes the drills too far apart. To ascertain whether this is the case one plot was sown with drills the usual width, 7 inches, and the adjoining plot $3\frac{1}{2}$ inches. It will be seen that the 7-inch drill yielded 1 bushel per acre more than the $3\frac{1}{2}$-inch.

This year's test of drills against broadcast machines has resulted as usual in favour of the drills. All the plots were in an exposed situation, and the press drill plot did not suffer as badly from wind as the others. This accounts largely for the difference in yield and date of ripening.

TEST OF DRILLS.

Variety.	How Sown.	Length of Straw.	Weight per Bushel.	Ripe.	Yield per Acre.
		Inches.	Lbs.		Bush. Lbs.
Red Fife, sown April 16.....	Wheels on Superior Drill ...	40	60	Aug. 26..	38 ..
do do 16.....	Chains do	40	60	do 26..	37 50
do do 6.....	Press Drill, $3\frac{1}{2}$ inches..... ..	34	61	do 23..	36 40
do do 6	do 7 do	35	$60\frac{1}{2}$	do 23..	37 40
do do 6.....	Common Drill, 6 inches. . .	36	$59\frac{1}{2}$	do 26..	35 25
do do 6.....	Press Drill, 7 inches.....	35	$60\frac{1}{2}$	do 23..	37 40
do do 6.....	Broadcast Machine.....	27 to 36	60	do 26..	33 30

This is the fourth time on this farm that drills have been pitted against broadcast machine, with the result each time that drills have given the largest yield, hence it is evident that drill sowing is preferable on soil similar to that on the Experimental Farm.

The two experiments first mentioned should be repeated before the results are considered final.

Preventives of Smut in Wheat.

Bearing in mind the immense losses sustained by the province, in 1891, through smut, it is unnecessary for me to point out the importance of this subject.

For the past three years experiments with smut preventives have been made on this farm, and they all point to the advisability of using bluestone (Sulphate of copper) for this purpose.

The result of the past season's experiments only emphasise this, and it appears almost criminal for a person to neglect so simple, inexpensive and certain a remedy.

The tedious and often inconvenient mode of soaking the seed in the bluestone liquid, has been found quite unnecessary. A liquid composed of 1 pound of bluestone, dissolved in a pail (10 quarts) of water and simply sprinkled on the seed wheat is quite efficacious and permits of the seed being drilled without drying, the only care necessary is that the grain be constantly stirred while the liquid is being applied, so that all the kernels are moistened.

Tables are herewith submitted, showing the results obtained this year by using various smut preventives. The first four experiments were carried out under instructions from F. T. Shutt, Chemist for the Dominion Experimental Farms, who also prepared the seed for sowing. The remaining three tests were arranged at this farm.

TEST of chemicals to prevent smut, size of plots, 10 feet square ; sown broadcast on May 14th ; soil, a light gravelly loam.

Variety.	Treatment.	Smutty heads.	Good heads.
Red Fife	Sulphate of iron	116	2,425
do	Agricultural bluestone	27	2,275
do	Sulphate of copper (bluestone)	4	2,375
do	Sulphate of copper and lime	15	2,300
do	Agricultural bluestone and lime	72	2,800
do	Untreated	190	2,150
Saxonka	Sulphate of iron	463	1,600
do	Agricultural bluestone	30	2,000
do	Sulphate of copper (bluestone)	15	2,800
do	Sulphate of copper and lime	56	2,600
do	Agricultural bluestone and lime	186	2,710
do	Untreated	504	2,142
Red Fife	Sulphate of iron	120	2,730
do	Agricultural bluestone	36	2,450
do	Sulphate of copper (bluestone)	8	2,550
do	Sulphate of copper and lime	27	2,260
do	Agricultural bluestone and lime	56	2,400
do	Untreated	142	2,359

Test of bluestone as a smut preventive, size of plots one fifteenth of an acre, common drill, seven pecks per acre, bluestone liquid sprinkled on the seed, results obtained by counting the wheat heads on ten feet square.

Variety.	How treated.	Weight per Bushel.	Yield.		Smutty Heads.	Heads with no smut.
		Lbs.	Bush.	Lbs.		
Smutty Red Fife	1 lb. bluestone to 5 bushels	59½	23	40	22	2,000
do	1 lb. do 10 do	59½	25	40	14	1,800
do	No bluestone	58½	19	50	700	1,610

The results from these experiments may be summarized as follows :—

1. That sulphate of iron is of very little use as a smut preventive.

2. That lime used with sulphate of copper for the purpose of lessening injury to the germination of seed is of no use for that purpose, and has a tendency to destroy the effectiveness of the sulphate of copper.

3. Sulphate of copper (bluestone), is decidedly the best preventive used and is remarkably uniform in its action ; and that 1 lb. to 10 bushels is as effective as twice that amount.

4. Agricultural bluestone, although next in value to sulphate of copper is still not nearly equal to it as a preventive of smut.

OATS.

The yield of oats this year throughout the province has been somewhat below the average, and the weight owing no doubt to the general prevalence of rust is also light.

The number of varieties of oats tested on the Experimental Farm is larger than usual and includes several kinds newly introduced from the east.

All the varieties being in the one field on apparently uniform soil and receiving similar treatment, the experiment as a comparison of varieties may be considered fairly reliable. None of the plots were injured by wind or frost, the field was in the higher

portion of the valley, and was thoroughly summer-fallowed the previous year, soil a light loam. The crop on this field being remarkably even and free of weeds was a source of interest to visiting farmers during the summer months.

The following varieties of oats were tested for the first time this year :—

Abundance, is a white branching oat fairly stiff in the straw but light in weight owing to rust ; it ripens somewhat late, the yield this year was 81 bushels per acre.

Abyssinian is also a white branching oat, it proved weak in straw but yielded 73 bushels per acre of rather light grain and suffered only slightly from the rust, it ripened in 108 days.

Siberian, a white sided or mane oat was fairly productive, yielding 72 bushels but proved very late, taking 118 days to mature : this variety had fairly stiff straw and very little rust.

White Hungarian gave the largest yield (87 bushels per acre) of any oat on the farm, it is a sided or mane oat, the straw was stiff but rusted badly and the grain was in consequence light in weight, it is a late variety.

Challenge White had very long and weak straw which rusted badly but the yield from this variety was 72 bushels per acre, weighing 37 lbs. per bushel, it ripened in 105 days, making it one of our earliest oats.

Giant Cluster, a white sided oat with stiff straw, suffered severely from rust, and was about the last oat on the farm to ripen, the yield was nearly 63 bushels per acre.

Victoria Prize, is a short bearded branching oat, fairly stiff in the straw, which was but slightly rusted ; the return from this variety was 70 bushels per acre ; it is early, ripening in 105 days.

Doncaster, a white oat with a branching head produced a stiff straw which rusted badly. This variety ripens fairly early, taking only 107 days to mature, and yielded something over 68 bushels per acre of fairly heavy oats.

White Dutch has very weak straw which rusted badly, it yielded 65 bushels per acre, the head is branching and the grain ripens quite early.

Joanette, a black oat with branching head, has thin weak straw, it gave a return of 73 bushels per acre of small light grain ; this oat did not rust to any extent, it ripened rather late, taking 111 days to mature.

Early Etampes, another thin weak strawed variety, it rusted more than the Joanette and yielded rather less, it ripened also in 111 days.

Many of these varieties are quite promising but another year's trial at least should be had before they can be intelligently compared with those generally grown in this province.

Varieties of Oats.

A test of varieties of oats sown with a Press Drill on 12th May, eight pecks per acre, on light black loam, summer fallowed. Size of plots, one-tenth of an acre.

Variety.	Number of Days maturing.	Length of Straw.	Character of Straw.	Kind of Head.	Length of Head.	Rust.	Weight per Bushel.	Date of Ripening.	Yield per Acre.
	Dys	Ins.			Ins.		Lbs	1892.	Bush.
White Hungarian	118	47	Stiff	Sided	10	Badly	34	Sept. 7	87·2
Australian	118	45	Fair	Branching	9	None	32	do 7	85·30
Banner	107	46	Stiff	do	10	Considerable	33	Aug. 27	82·12
Abundance	110	45	Fair	do	7	Badly	33	do 30	81·26
Golden Side	111	45	Weak	do	8	do	33	do 31	79·14
Archangel	105	37	Fair	do	8	Little	39	do 25	78·28
Rosedale	107	45	Stiff	½ sided	9	Slightly	37	do 27	76·16
Potato	110	47	Fair	Sided	9	Badly	37	do 30	74·24
Joanette	111	42	Weak	Branching	10	None	34½	do 31	73·18
Abyssinian	108	43	do	do	10	Slightly	34	do 28	73·18
Welcome	105	46	Fair	do	10	do	35½	do 25	72·32
Early Etampes	111	37	Weak	do	8	do	34	do 31	72·22
Challenge White	105	51	Very weak	do	10	Very badly	37	do 25	72·22
Siberian	118	49	Fair	Sided	10	Slightly	38	Sept. 7	72·16
Improved Black Tartarian	108	48	Weak	do	9	Considerable	35	Aug. 28	72·2
Early Gothland	109	45	do	½ sided	8	Slightly	30	do 29	72·2
Improved Ligowo	107	40	Stiff	Branching	8	do	37	do 27	71·16
English White	106	47	Weak	do	10	do	32½	do 26	71·16
White Russian	113	44	Very weak	½ branching	10	do	32	Sept. 2	71·16
Black Champion	108	47	Weak	Sided	10	Considerable	35	Aug. 28	70·30
Victoria Prize	105	44	Fair	Branching	7	Slightly	35	do 25	70·20
American Triumph	120	56	Very stiff.	do	11	do	31	Sept. 9	70·20
Holstein	113	47	Stiff	do	9	None	34½	do 2	69·4
Doncaster	107	45	do	do	10	Badly	37	Aug. 27	68·28
Glenrothern	118	36	do	do	10	Considerable	34½	Sept. 7	65·30
White Dutch	105	51	Very weak	do	10	Very badly	35	Aug. 25	65·20
Early Blossom	115	40	Stiff	½ sided	10	Slightly	33	Sept. 4	65·10
Cream Egyptian	96	34	do	Branching	10	do	39	Aug. 16	65·8
Prize Cluster	100	44	do	½ sided	9	do	35½	do 20	63·18
Giant Cluster	121	44	do	Sided	9	Considerable	34	Sept. 10	62·32
Winter Grey	102	47	do	Branching	10	Slightly	38½	Aug. 22	61·26
Bonanza	96	42	Very stiff.	do	8	do	40	do 16	60
Early Race Horse	104	47	Fair	do	10	do	36	do 24	58·8
Swedish	118	46	Stiff	Sided	11	do	29½	Sept. 7	58·8
Rennie's Prize White	100	43	Weak	Branching	13	Considerable	36	Aug. 20	50

Barley.

Although the yield of barley here this year has not equalled that of last season the returns are still fair.

The heavy rains on July 16th succeeding a month of very dry weather, started a second growth, the grain from which did not ripen until late ; this seriously injured the color and weight of the sample.

Twenty nine varieties were sown on adjoining plots in the valley ; the soil of these plots was apparently alike in character and the experiment as a comparison of varieties may be taken as fairly reliable.

Twenty one of the same varieties were also sown on higher portions of the farm on gravelly loam, and this field being somewhat undulating the soil was not quite uniform ; the results are however useful showing as they do how the several sorts are likely to succeed on the lighter soils of the Province.

Many varieties were badly lodged here this year, and the necessity of sowing only stiff strawed sorts was more than ever apparent, the Duck-Bill, California Prolific and Goldthorpe among the two rowed, and nearly all the six rowed varieties are of this character and should be sown in preference to those having weaker straw.

Owing to the low price of wheat, barley is at present receiving a large share of attention here and the following suggestions regarding its cultivation are offered.

1. Select clean land, summer-fallow preferred.
2. Never sow barley on fall ploughing; it is generally too dry.
3. If on spring ploughing, plough, sow and harrow the same day, so as to retain moisture.
4. Always use a drill (press preferred) broadcasting leaves too many grains near the surface to dry out.
5. Sow pure, clean and plump seed of a stiff strawed variety.
6. When harvesting do not neglect Barley altogether for your wheat.

Varieties of Barley.

Results of tests of varieties of barley on black loam soil; in valley; sown on 20th May, with press drill, six pecks per acre; summer-fallow; size of plots, one-tenth of an acre.

Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight per bushel.	Ripe.	Days maturing.	Yield per Acre.
	Inch.		Inch.		Lbs.			Bush. Lbs.
Goldthorpe	34	Very stiff	3	2 row	51	Sept. 3	106	67 24
Italian	33	Stiff	3	2 do	49½	Aug. 25	97	60 40
Swedish	31	do	4	2 do	52	do 26	98	57 14
Sharpe's Improved	29	do	3½	2 do	51	do 26	98	56 32
Duck-bill	32	do	2¼	2 do	49½	do 25	97	54 28
Phœnix Von Thalen	31	do	3½	2 do	52½	do 23	95	54 08
Saale	32	Weak	4½	2 do	51	do 30	102	53 46
Prize Prolific	31	Fair	4	2 do	50	do 26	98	52 44
New Zealand	28	Stiff	3½	2 do	53	do 25	97	52 34
Bestehorns	32	Weak	4	2 do	50	do 31	103	52 24
Rennie's Improved, six-row		Very stiff	2	6 do	52	do 16	88	51 42
Prolific	33	Very weak	4	2 do	50	do 26	98	51 22
Danish Chevalier	34	Fair	4	2 do	51½	do 25	97	51 12
Thanet	29	Weak	3½	2 do	51	do 25	97	49 28
English Malting	34	do	4½	2 do	49	do 25	97	48 16
Peacock	33	Stiff	2½	2 do	51	do 25	97	43 16
Beardless	34	Very weak	3½	2 do	50	do 29	101	45 10
Webb's Kinver Chevalier	37	do	4½	2 do	50	do 29	101	45 00
Odessa	34	Stiff	5	6 do	51	do 19	91	45 00
Indian, Kangra District				6 do	40	Sept. 10	113	43 18
Peerless White	30	Weak	3½	2 do	51	Aug. 25	97	42 44
Rice or Fan	25to35	Stiff	3	2 do	49½	do 26	98	42 14
Mensury	40	do	5	6 do	48	do 19	91	41 02
California Prolific	30	do	2½	2 do	50½	do 25	97	38 46
Selected Chevalier	33	Very weak	3	2 do	51	do 25	97	38 26
Golden Melon	34	Weak	3	2 do	50	do 25	97	36 02
Baxter's six-rowed	34	Stiff	4	6 do	51	do 19	91	32 24
Spiti Valley	20	do		6 do	58	do 14	86	27 44

Barley on Gravelly Loam

Barley sown on gravelly loam, field undulating with a southern exposure, sown on 18th May, with a common drill, seven pecks per acre, land summer fallowed, size of plots one-tenth acre, field not quite uniform.

Variety.	Length of Straw.	Length of Head.	Kind of Head.	Character of Straw.	Ripe.	No. of Days Maturing.	Yield per Acre.	Weight per Bushel.
	Inch.	Inch.					Bush. Lbs.	Lbs.
Swedish	30	3	2 row..	Fair.	Aug. 27..	101	58 6	52
Prize Prolific	33	4	2 do ..	Weak	do 27..	101	51 32	49½
Sharpe's Improved	31	3	2 do ..	do	do 27..	101	47 34	52
Beardless	28	4	2 do ..	Fair.	do 27..	101	44 28	51
Selected Chevalier	32	3½	2 do ..	do	do 27..	101	43 36	51
Danish Printice	31	4	2 do ..	Weak	do 27..	101	42 44	50½
California Prolific	23	3	2 do ..	Stiff.....	do 22..	96	42 34	49
Thanet	33	3	2 do ..	Weak	do 27..	101	41 42	51
English Malting	34	4	2 do ..	do	do 27..	101	40 20	50
Webb's Kinver Chevalier	33	3½	2 do ..	do	do 26..	100	39 28	51
Danish Chevalier	31	4½	2 do ..	do	do 27..	101	38 36	51½
Goldthorpe	33	3	2 do ..	Stiff....	do 28..	102	36 42	49
New Zealand	32	3¾	2 do ..	do	do 27..	101	36 32	52½
Golden Melon	31	4	2 do ..	Weak	do 27..	101	35 20	51
Duck-bill	30	3	2 do ..	Stiff.....	do 27..	101	34 28	49
Rennie's Improved	24	1½	6 do ..	do	do 15..	89	33 16	52
Odessa	30	2	6 do ..	do	do 15..	89	33 6	49½
Peerless White	31	3	2 do ..	Weak	do 27..	101	32 24	50½
Mensury	20	3	6 do ..	Stiff	do 22..	96	30 10	48½
Baxter's Six-rowed	30	2	6 do ..	do	do 15..	89	30 ..	50
Spiti Valley, six-rowed	16	2	6 do ..	do	do 13..	87	19 28	58

Test of Drills with Barley.

This year's experiments with the different kinds of Drills for sowing barley fully corroborate previous tests, and it is evident that with every acre of barley sown with a broadcast machine in this province there is a loss of from five to eleven bushels per acre. This, and the inferior seed used, is largely responsible for the comparatively small yields of barley reported from some parts of the province :—

Variety.	Kind of Drill.	Ripe.	Yield per Acre.	Weight per Bush.
			Bush.	Lbs.
Duck-bill	Press Drill, wheel coverer	Aug. 31..	58·16	49
do	do chain coverer	do 31..	49·18	49
do	Common Drill	do 31..	52·44	49
do	Broadcast	do 31..	47·4	48

Early, Medium and Late Sowing of Grain

In accordance with instructions received from the Director a series of experiments were undertaken with a view of determining the proper date for this province to sow the different kinds of grain.

Arrangements were made to sow two plots of one-tenth acre of wheat, oats and barley every Saturday, commencing on 23rd April, a snow storm, however, prevented us sowing on the 30th of April, but with this exception the experiment as at first planned was carried ont.

Red Fife and Campbell's White Chaff wheats, Banner and Prize Cluster oats, Goldthorpe and Kinver Chevalier barleys, were the varieties selected for sowing in each case.

The last two sowings of Red Fife only graded No. 1 frozen, balance was all No. 1 Hard. The last sowing of Campbell's White Chaff was also No. 1 frozen, balance No. 1 Northern.

As an evidence of the uniform character of the soil in this series of experiments I would call attention to the fact that in every instance the yield of Red Fife wheat exceeded the Campbell's White Chaff sown at the same date, and in like manner the Banner gave larger returns than the Prize Cluster, but the Campbell's White Chaff wheat and Prize Cluster oats proved earlier in every case.

It is noticeable that the combined maximum yield of the two varieties of wheat was from the sowing on May 7th, from oats sown May 28th, and barley May 21st. This is not in accordance with our usual expectation; earlier sowing generally giving the largest returns; and can only be accounted for by the late sown grain receiving more benefit from the abundant rain of July 15th, than the earlier sown plots.

A glance at the accompanying table will show a close connection between the dates of sowing and ripening, and should stimulate farmers to sow as early as possible to secure fredom from injury by frost.

Wheat.

Early, medium and late plots of wheat, one-tenth acre; soil, rich loam; land, summer-fallowed previous year, situated in valley, sown with Press Drill, 1½ bushels per acre.

When Sown	Variety.	Character of Straw.	Length of Straw.	Length of Head.	Rust.	Weight per bush.	Ripe.	Days in maturing.	Yield per acre.
			Inch.	Inch.		Lbs.			Bush.
April 23..	Red Fife..	Stiff....	36	3¼	None.....	60	Aug. 26	125	33·20
do 23..	Campbell's White Chaff ..	do	37	3	do	59½	do 23	122	32·50
May 7..	Red Fife.....	do	37	3½	do	59	do 28	113	36·50
do 7..	Campbell's White Chaff...	do	37	3¼	do	58½	do 26	111	35·30
do 14..	Red Fife..... ...	do	38	3½	do	59	do 29	107	37·10
do 14..	Campbell's White Chaff...	do	40	3½	do	56½	do 31	109	30·30
do 21..	Red Fife.....	do	39	3	do	59	Sept. 8	110	33·30
do 21..	Campbell's White Chaff...	do	42	2½	Little on stalk.	58½	do 2	104	30·50
do 28..	Red Fife.....	do	40	3	None.....	58	do 13	108	29·40
do 28..	Campbell's White Chaff...	do	41	2½	Little on stalk.	56	do 6	101	24·50
June 4..	Red Fife	do	38	2½	do ..	58	do 15	103	28·00
do 4..	Campbell's White Chaff...	do	40	2	Stalk badly...	57	do 10	98	19·30

Oats.

Early, medium and late plots of Oats, one-tenth acre ; soil, gravelly loam, summer-fallowed previous year, situated on the upland prairie, sown with Press Drill, 2 bushels per acre.

When Sown.	Variety.	Character of Straw.	Length of Straw.	Length of Panicle.	Rust.	Weight per bush.	Ripe.	Days in maturing.	Yield per acre.
			Inch.	Inch.		Lbs.			Bush.
April 23..	Prize Cluster	Stiff ..	41	9	Little	35⅕	Aug. 12	111	30·30
do 23..	Banner	do	38	9½	Considerable..	33½	do 22	121	59·24
May 7..	Prize Cluster	do	41	9	Little	37	do 15	100	33·8
do 7..	Banner	do	36	9	Considerable..	31⅘	do 26	111	70·10
do 14..	Prize Cluster	do	42	9	Little	34⅘	do 17	95	33·8
do 14..	Banner	do	42	9	Considerable..	32	do 27	105	69·5
do 21..	Prize Cluster	do	42	9	Little	31	do 25	96	50·30
do 21..	Banner	do	45	9	Considerable..	31½	do 29	100	60·10
do 28..	Prize Cluster	.....	41	9	Little	33	do 25	89	55·30
do 28..	Banner	.....	42	8	Considerable..	34	Sept. 1	96	62·22
June 4..	Prize Cluster	Stiff....	45	9	do ..	34	Aug. 28	85	53·18
do 4..	Banner	do	45	7	Little	34	Sept. 7	95	60·2

Barley.

Early, medium and late plots of barley, one-tenth acre. Soil, gravelly loam, summer fallowed previous year, upland prairie. Sown with Press Drill. Two bushels per acre.

When Sown.	Variety.	Character of Straw.	Length of Straw.	Length of Head.	Rust.	Weight per Bushel.	Date of Ripening.	Days in Maturing.	Yield per Acre.
1892.			Ins.	Ins.		Lbs	1892.		Bush.
April 23..	Kinver Chevalier	Stiff.....	32	3½	Badly	52½	Aug. 15..	114	40·20
do 23..	Goldthorpe	do	37	3	Considerable ..	51	do 24..	123	50·20
May 7..	Kinver Chevalier	do	31	4	Badly	52½	do 23..	108	50·00
do 7..	Goldthorpe	do	39	3½	Considerable ..	51	do 27..	112	55·30
do 14..	Kinver Chevalier	do	30	4	Badly	52	do 26..	104	51·32
do 14..	Goldthorpe	do	39	3½	None	51½	do 30..	108	51·32
do 21..	Kinver Chevalier	Weak ...	35	4	Badly	50	do 28..	99	51·22
do 21..	Goldthorpe	Very stiff.	38	3½	None	50	Sept. 7..	109	64·28
do 28..	Kinver Chevalier	Very weak	31	3½	do	49	Aug. 30..	94	52·34
do 28..	Goldthorpe	Very stiff.	35	3	do	49½	Sept. 7.	102	61·2
June 4..	Kinver Chevalier	Very weak	35	3½	do	50	do 7..	95	61·33
do 4..	Goldthorpe	Very stiff.	35	3	do	49½	do 12..	100	53·19

Field Pease.

When we consider how well field pease have succeeded on this farm it is surprising that farmers generally do not grow them more extensively, the yield here has always been fair and the sample excellent, the ready sale and good prices obtainable for pease and their usefulness for fattening purposes should induce farmers to cultivate them more largely.

On the Experimental Farm the following treatment has been found suitable for this crop.

Sow only on soil naturally well drained.

It is useless to attempt their cultivation on weedy land, weeds grow so rank here that they soon choke the pease.

Well rotted back-setting or clean summer fallow are suitable.

Sow as deep as possible with a drill, from $2\frac{1}{2}$ bushels to $3\frac{1}{2}$ bushels per acre according to size of pease.

Multiplier, Crown and Prince Albert are all suitable varieties for this country.

A number of new varieties of peas have been grown here this year; among them the Potter, a medium-sized grain, and the Pride, a larger pea, are quite promising. The Daniel O'Rourke is a handsome pea and very early; the supply of seed of this variety being small, we are not able to give the yield per acre. All the varieties were sown on summer fallow with a common drill, two and a half to three and a half bushels per acre; soil a gravelly loam; size of plots one-tenth of an acre.

Variety.	When Sown.	Length of Straw.	Length of Pod.	Ripe.	Yield per Acre.
					bush.
Crown	May 7	23 inches	2 inches	Aug. 27	31·50
Prince Albert	April 25	53 do	$2\frac{3}{4}$ do	do 31	31·40
Potter	May 7	34 do	$3\frac{3}{4}$ do	Sept. 1	30·40
White Eyed Marrowfat	do 7	40 do	3 do	do 1	30·00
Multiplier	April 25	50 do	$2\frac{3}{4}$ do	Aug. 31	29·00
Pride	May 7	23 do	3 do	do 25	28·20
Early Field	April 25	28 do	2 do	do 24	26·40
Prussian Blue	May 7	35 do	$2\frac{1}{2}$ do	do 30	22·30
Black Eyed Marrowfat	April 25	40 do	3 do	Sept. 7	21·00
Mummy	do 25	35 do	2 do	do 7	19·40
Daniel O'Rourke	do 25	35 do	2 do	Aug. 1	.....

Buckwheat.

Seven varieties of buckwheat were grown this year; all were sown with a Planet Junior drill, in rows one foot apart, and kept free from weeds during the season of growth. As this crop is often used for the purpose of green manure, 6 x 15 feet of each plot was weighed in the green stage.

The yield of seed was calculated from the produce of a plot 6 x 115 feet, and such large yields per acre must not be looked for from large fields grown with ordinary field culture.

Variety.	In Bloom.	Ripe.	Height.	Weight of Green Straw per Plot.	Yield of Grain per Acre.
					bush.
Rye Buckwheat	July 30	Aug. 17	46 inches	45 lbs.	51·28
Tartarian Buckwheat	do 30	do 18	44 do	55 lbs.	50·12
Common do	do 26	do 17	46 do	40 lbs.	38·17
Silver Skin do	do 26	do 15	56 do	35 lbs.	37·1
Japan do	do 28	do 20	47 do	30 lbs.	34·18
Grey do	do 24	do 16	58 do	42 lbs.	33·3
Nepaul do	do 26	do 17	53 do	20 lbs.	31·35

Seed Grain Distribution.

The distribution of seed grain from the farm has greatly increased during the past year: 344 parcels have been sent out principally in two bushel lots, a fair price has been charged in each case, and reports are coming in daily regarding its success in different parts of the country, these will be useful for reference and will be compiled when another year's experience has been obtained.

Mixed Grain for Hay and Green Fodder.

The success of the experiments undertaken here last year with mixed grain for hay and green fodder attracted considerable attention, and many farmers anticipating a light yield of wild hay have this year grown large areas of this useful crop.

Last year the land used for this purpose was all summer-fallow, but realizing that farmers have very little fallow land to spare for this purpose, a change to stubble land, spring ploughed was made this year; for this reason, the yield is somewhat lighter, but is still good.

In addition to the combinations used last year it will be noticed that a mixture of wheat and pease has been tried with satisfactory results.

All were sown on May 27th, with a Press Drill, as pease and tares succeed best if grown alone, these were first sown east and west, and then the other grain north and south, although this plan gives double labour in sowing, the increased gain in fodder more than pays for the extra work.

Mixed grain for hay and green fodder.

Variety.	Pecks per Acre Sown.	Stage when cut.	Weight per Acre.	
			Dry.	Green.
			Tons. Lbs.	Tons. Lbs.
Oats—Black Tartarian	8	In early milk	3 975	6 1,850
Tares—Large English	8	Podded		
Oats—Black Tartarian	8	In early milk	3 925	4 1,950
Pease—Multiplier	8	Podded		
Wheat—Eureka	6	In early milk	3 925	4 1,950
Pease—Multiplier	8	Podded		
Barley—Duck-bill	7½	In early milk	3 300	4 1,625
Pease—Multiplier	8	Podded		
Barley, 1st cut—Rennie's six rowed	7½	In early milk	2 25	6 250
Tares do —Large English	8	Podded		
Barley, 2nd cut—Rennie's six-rowed	7½	Commencing to head	1 1,550	.....
Tares do —Large English	8	In bloom		
Rye, 1st cut—Spring	8	Late milk	1 1,125	2 1,675
Tares do —Large English	8	Podded		
Rye, 2nd cut—Spring	8	In head	1 25	1 1,600
Tares do —Large English	8	In bloom		

Grasses.

The past severe winter coupled with the light snow-fall in this portion of the province was unusually injurious to nearly all the imported clovers and grasses and the following were completely killed on this farm, Sanfoin, Lucerne, Mammoth Red, Common Red, Bokhara, and Yellow Clovers.

The following cultivated grasses were also winter killed, Orchard Grass, Perrennial and Italian Rye Grass.

As the cultivated Rye Grasses and Yellow Clover have now been tried on this farm for three seasons and have always been winter-killed, it may be safely concluded that they are too tender for this province.

The other varieties of clover and grasses mentioned above, stood the winter of 1890–91 without injury and should receive further trial before they are condemned for this country.

The following were quite hardy, but owing to the very dry weather in the early part of the season the return from them was light, Timothy, Bromus inermis, Hard and Sheep Fescue and White Dutch Clover.

Native Grasses grown under Cultivation.

I have great pleasure in reporting continued success with the native grasses.

Although grown on similar soil the native varieties are found to withstand both drought and frost much better than Timothy, and have this year yielded from two to three times as much hay per acre.

The plots sown with the native grasses in 1889 are still vigorous, and it is evident that they are all true perennials and not likely to run out quickly.

In addition to the small plots sown in 1889, a number of larger plots have been sown on different parts of the farm each spring since then, these have all given large returns during the past season and proved successful on the lighter soils of the uplands as well as on the heavier loam in the valley.

As it is desirable to save as much of the seed of these grasses as possible for use on the several experimental farms and for distribution to the farmers of the North-west, only small portions of the plots were cut green for ascertaining the yield ; the balance was allowed to ripen and some hundreds of pounds of seed have been obtained from them.

Yiled of native grasses and timothy.

Variety.	When sown.	In bloom.	Height.	Yield per acre.	
				Dry.	Green.
			Inches.	Tons. Lbs.	Tons. Lbs.
Elymus Americanus	Spring 1891	July 20	48	3 1,200	7 600
Elymus Virginicus	do do	do 29	41	3 1,000	5 1,200
Agropyrum tenerum	do do	do 15	47	2 1,200	4 1,800
Muhlenbergia glomerata	do 1889	do 29	30	1 1,050	....
Timothy	do 1890	.....	30	1,025	....
do	do 1891	....	41	1 720	....

Fodder Corn.

This useful fodder plant has again given us a good return.

The field selected for this crop had a strong loamy soil and a southern exposure, the previous crop was barley, the stubble was ploughed in spring and harrowed a number of times, and a common wheat drill sowed the corn quite evenly in rows 3 feet apart and about 6 inches apart in the row. As soon as the grain was up a cultivator was run through the drills and all weeds kept down by this means through the summer, it will be seen by the accompanying table that many of the varieties gave a large return, but for this country only the early sorts should be sown.

The North Dakota Flint is one of the best for this locality, it ripens early gives a fair return of fodder, is short enough to cut with a binder and is very leafy.

Besides the plots for testing, 4 acres of the North Dakota variety was sown at the same time, and nearly all put into the farm silos ; the balance has been left in cone shaped stooks in the field and its value for food in the dry state will be tested during the winter.

Answers to the numerous enquires received regarding this crop may be summarized as follows :—

1. Select an early ripening variety.
2. A field having a southern exposure if possible.
3. Plough in spring and harrow often to start and kill weeds.
4. Sow under 30 lbs. seed per acre, price here $2 to $3 per bushel.
5. Sow with a wheat drill in rows 3 feet apart, grains 6 inches apart in the row, test your drill on a floor or hard road before sowing.

6. Start the cultivator as soon as the corn is above ground.

7. Keep all weeds killed during the growing season.

8. Cut before you commence wheat harvest or you may not spare time to cut it at all.

9. If you have no silo, stook in cone shape and fence from cattle, it will heat in a stack.

FODDER CORN.

Variety.	Tasselled.	Silk.	Early milk.	Late milk.	Stage when cut.	Height.	Leafiness.	Average No. Stools.	Yield per acre, green.
						ft. in.			Tons. Lbs.
Rural Thoroughbred White Flint	Aug 15	Aug 23	.....	.....	Silk.	8	Very leafy	6	27 1,000
Red Cob Ensilage	do 23	.....	.....	.....	Tasselled..	9	Few leaves	2	26 800
Mammoth Southern Sweet	do 30	.....	.....	.....	Tassel. ...	9 6	Very leafy	4	26 140
White Flint	do 11	Aug 22	Aug 31	.....	Early milk	8 9	Leafy	5	23 200
Pearce's Prolific	do 4	do 14	do 31	.....	do	8 9	do	6	22
Longfellow	do 5	do 15	do 31	.....	do	9	do	4	20 1,800
Smut Nose Flint	do 4	do 15	do 23	.....	do	8 9	do	5	20 1,800
Cinquantine	do 4	do 12	do 20	.....	do	7	Not leafy.	2	20 1,800
Rustler	do 4	do 15	do 31	.....	do	10	Few leaves	1	20 1,140
Angel of Midnight	do 4	do 15	do 20	.....	do	8 6	Very leafy	4	20 1,140
Pride of the North	do 11	do 17	do 25	.....	do	8	Leafy	3	19 940
Northern Dakota	do 3	do 14	do 20	Aug 31	Late milk.	8	Very leafy	7	19 940
Crosby's Early Sugar	do 11	do 17	do 25		Early milk	7	do	6	17 1,200
Dakota Gold Coin	do 2	do 12	do 22	do 31	do	9	Leafy ...	2	17 1,200
Mitchell's Extra Early Flint	July 29	do 9	do 15	do 23	Late milk.	6	Very leafy	6	17 1,200
Dakota Dent	Aug 1	do 15	do 24	.....	Early milk	10	Leafy	2	14 600
Ride out	do 6	do 15	do 30	.....	do	8	do	5	12 200

MILLETS.

The seed of a very fine collection of millets was received from the Central Experimental Farm and they were sown on the 8th June in adjoining plots with a Planet Junior seed drill in rows one foot apart: they were kept free from weeds during the season of growth and all produced a heavy crop running from 48 to 75 inches in height and thick on the ground.

The accompanying table gives full particulars regarding each of these varieties.

As the bulk of the crop was required for exhibition purposes the area cut green was too small to permit of giving the yield per acre.

The following are among the most promising of the newly introduced varieties. Red Millet, a red seeded branching millet. Chana and Branching Millet are both very tall and branchy, but the Chana is fully a month later in coming in head. Choice Round White millet is a white seeded branching millet.

All the varieties formed seed here except the Chana and Italian millet, but the seed has not yet been tested for vitality and may not have fully matured.

As the question of suitable hay and fodder plants is so important for this province, I would suggest that larger quantities of seed of the more promising sorts be procured for test next season.

Millets.

Thirteen varieties were sown on 8th June in rows one foot apart with a planet junior drill, soil black loam, not manured, size of plots 5 x 13 feet.

Variety.	In Head.	Ripe.	Height.	Yield per Plot.	
				Dry.	Green.
			Inches.	Lbs.	Lbs.
Branching Millet	July 24	Sept. 9	75	27	70
Hungarian Grass	do 31	do 10	51	24	65
Italian Millet	Aug. 30	did not ripen	40	23	75
Common Millet	July 31	Sept. 5	50	22	50
Red Millet	Aug. 2	do 2	61	21	60
Hungarian and Millet mixed	July 31	do 10	51	21	55
Chana from Kulu, India	Aug. 24	did not ripen	68	20	55
Choice Round White Millet	do 2	Sept. 2	64	20	50
Round White Millet	do 2	do 2	63	19	50
Long headed Millet or Golden Wonder	do 22	do 10	44	18	55
California Green Millet	July 31	do 5	50	17	55
Manitoba Millet	do 31	do 3	57	17	45
Black Millet	do 30	do 1	54	16	40

Silos.

The two silos gave good satisfaction last season, and have been again, filled this year, fodder corn has been almost exclusively used for this purpose, the corn used was the North Dakota variety cut with a Massey Binder when in the early milk stage, it was allowed to wilt two days then cut into one inch lengths with a Watson cutting box and conveyed at once into the silos.

The ensilage from this year's well matured and wilted corn is found to be sweeter and every way better than that made last year from immature and unwilted corn.

A small quantity of green oats was also cut and put into the silo, but it does not make as good ensilage as corn and the yield per acre is much less.

Field Roots.

The past season has been favourable for a large yield of all kinds of field roots, and the soil selected on the farm for the purpose being uniform, the experiment may be considered a fair test of varieties.

No manure was used with any of the roots, and the land received but one ploughing in spring, followed by several harrowings.

It is evident from the good returns which have been obtained with roots since this farm was established that there should be no scarcity of succulent food in this province during the winter for all kinds of stock, and if farmers would engage more extensively in mixed farming, it would tend to remove a large amount of the anxiety felt in the fall months regarding frost.

The Purple Top Swede has again given the largest yield, and the best shaped roots, and this variety can with safety be recommended for general cultivation here.

The yield per acre has been calculated from the results obtained from three rows of each variety of roots, one chain long.

Result of Experiments with Turnips during 1892.

Turnips were sown in flat drills 2½ feet apart. The land was in fodder corn the previous year. Two sowings were made, one on the 30th May and one on 6th June; taken up 21st October.

Variety.	Yield from Plots sown 30th May.			Yield from Plots sown 6th June.		
	Yield per Acre.			Yield per Acre.		
	Bush.	Tons.	Lbs.	Bush.	Tons.	Lbs.
Rennie's Prize Purple Top (Rennie)	1,019	30	1,140	655	19	1,300
Hazard's Improved	908	27	480	572	17	320
Sutton's Champion (Pearce)	852	25	1,120	673	20	380
Mammoth Purple Top (Evans)	833	24	1,980	704	21	240
Carter's Prize Winner (Pearce)	816	24	960	836	25	160
Selected Purple Top (Steele)	809	24	540	792	23	1,520
Bangholm's Improved Purple Top (Rennie)	752	22	1,120	638	19	280
Jumbo or Monarch (Steele)	733	21	1,980	704	21	240
Carter's Elephant Swede (Bruce)	695	20	1,700	660	19	1,600
Marquis of Lorne's Purple Top (Bruce)	675	20	500	528	15	1,680
Hartley's Bronze Top (Pearce)	655	19	1,300	629	18	1,740
Rennie's Elephant or Giant King (Rennie)	617	18	1,020	565	16	1,900
Bronze Top Extra (Evans)	488	14	1,280	660	19	1,600
Novelty No. 1 (Rennie)	.....	.....	.....	884	26	1,040

Yield of Mangels and Sugar Beets.

The seed was sown in flat drills 2½ feet apart, two sowings were made, one on May 30th and one on June 6th, the roots were pulled October 15th, the land was in fodder corn the previous year.

Variety.	Sown 30th May.			Sown 6th June.		
	Yield per Acre.			Yield per Acre.		
	Bush.	Tons.	Lbs.	Bush.	Tons.	Lbs.
Gate Post or Long Red (Bruce)	1,460	43	1,600	1,157	34	1,420
Mammoth Long Red (Steele)	1,302	39	120	1,205	36	300
Pearce's Canadian Giant (Pearce)	1,245	37	700	976	29	560
New Giant Yellow Intermediate (Steele)	1,232	36	1,920	Destroyed by cut worm.		
Red Globe (Bruce)	1,069	32	140	829	25	1,480
Carter's Warden Prize Yellow Globe (Pearce)	1,056	31	1,360	902	27	120
Berkshire Prize (Evans)	985	29	1,100	866	25	1,960
Rennie's Mammoth Long Red (Rennie)	985	29	1,100	1,064	31	1,840
Yellow Globe (select) (Steele)	941	28	460	778	23	680
Golden Fleshed Tankard (Steele)	910	27	600	805	24	300
Red Globe Oberndorf Extra (Evans)	862	25	1,720	866	25	960
Red Fleshed Tankard (Bruce)	796	23	1,760	809	24	540
Klein Wanzleben (Vilmorin)	629	18	1,740			
Vilmorin's Improved (Vilmorin)	616	18	960			
Kruger's seed	554	16	1,240			
Brabant (Vilmorin)	429	12	1,740			

Results of Tests with Carrots.

The seed was sown in flat drills 1½ feet apart; two sowings were made, one on 30th May and one on 6th June; harvested 18th October. This land was in fodder-corn the previous year.

Variety.	Sown 30th May. Yield per Acre.			Sown 6th June. Yield per Acre.		
	Bush.	Tons.	Lbs.	Bush.	Tons.	Lbs.
Carter's Orange Giant (Pearce)	462	13	1,720	283	8	980
Iverson's White (Ewing)	462	13	1,720	288	8	1,280
Mammoth Smooth White (Bruce)	452	13	1,120	418	12	1,080
Improved Short White (Steele)	422	12	1,320	464	13	1,840
Chantenay (Rennie)	408	12	480	259	7	1,540
Mammoth White Intermediate (Rennie)	403	12	180	403	12	180
Giant Short White Vosges (Simmers)	356	10	1,360	308	9	480
Early Gem (Rennie)	337	10	220	349	10	940
Guerande, or Ox Heart (Steele)	334	10	40	344	10	640
Rennie's Improved Half Long White (Rennie)	330	9	1,800	457	13	1,420
Giant White Belgian (Steele)	317	9	1,020	317	9	1,020
Danver's Orange (Steele)	310	9	600	290	8	1,400

Potatoes.

The past season has been an excellent one for potatoes, and both yield and quality are all that could be desired.

One hundred varieties were tested on this farm, and the following tables contain particulars regarding yield, earliness, &c., of seventy-six of the best of them.

Early Gem and Lizzie's Pride, two of the varieties introduced from the east this year, are most promising, being productive and of good quality.

The first twenty-two varieties are from seed sent from the Central Experimental Farm, and are being grown on uniform plots on all the experimental farms. Among them are many excellent sorts, but some of them are too late for this province.

It is probable that the production of potato starch could be undertaken with profit in this country. In some of the eastern provinces, where the yield of potatoes does not average more than one-half of that obtained in this country, the production of starch is found profitable for both farmer and manufacturer.

Experiments with Potatoes.

Results obtained from twenty-two varieties of potatoes grown from seed originally obtained from the Central Experimental Farm, Ottawa, planted May 27th in rows three feet apart, the cuttings placed one foot apart in the row; all were dug on Oct. 1st; the yields are calculated from the produce of one row, one chain long, no manure was used, and the previous crop was fodder corn.

Variety.	Yield per Acre.	Earliness.	Quality when Cooked.		Growth of Plant.	Size.
			Dryness	Flavour		
	Bush.					
Clarke's No. 1	414	Very early	Dry	Good	Strong	Large.
White Star	385	Late	Fair	Fair	do	Medium.
Early Puritan	374	Medium early.	Dry	Good	do	Large.
Halton Seedling	363	Very early	do	Fair	Medium	do
Empire State	352	Late	do	Good	Very strong	Medium.
Delaware	348	do	Fair	do	do	Large.
Early Eating	348	Very early	Dry	do	Medium	Medium.
Early Maine	344	Medium early.	do	do	do	do
Early Rose	332	do	do	do	do	do
Rose's New Giant	322	Very late	Wet	Poor	Strong	Large.
Thorburn	304	Medium early.	Dry	Good	Medium	Medium.
Rural New Yorker, No. 2	282	Very late	do	do	Strong	Large.
Lee's Favourite	278	Very early	do	do	Weak	do
Chicago Market	264	Late	do	do	Medium	Very large.
May Queen Early	260	Medium early.	do	do	do	Small.
Vanguard	256	Early	Fair	Fair	do	Large.
London	256	Medium early.	Dry	Good	do	do
Rural Blush	245	do	do	do	Strong	do
Ohio Gunner	238	Very early	do	do	Below medium	do
Early Ohio	231	do	Fair	do	do	Medium.
Algoma, No. 1	223	do	Dry	do	Medium	Large.
Beauty of Hebron	161	Medium early.	do	do	Below medium	do

Particulars of fifty-four varieties of potatoes, mostly selections from varieties grown on this farm in previous years, with some additional ones procured this year. Those marked C. E. F. are seedlings originated on the Central Experimental Farm. The date and manner of planting of this collection was the same as that last mentioned; the soil in each case was a rich black loam.

Variety.	Yield per Acre.	Earliness.	Quality when Cooked.		Growth of Plant.	Size.
			Dryness	Flavor.		
	Bush.					
Early Gem	443	Medium early.	Ex. dry.	Good	Medium	Large.
Early Fortune	421	do	Fair	Fair	Very strong	do
Lizzie's Pride	396	Late	Dry	Good	Strong	do
Munro County	370	do	Fair	do	do	do
C. E. F., No. 80	359	Very late	do	Fair	do	do
New Badger State	359	do	Dry	Good	Very strong	do
Snow Flake	352	Medium early.	do	do	Medium	do
C. E. F., No. 9	348	do	do	do	Strong	Medium.
Jackson's Improved	348	Very late	Wet	Poor	Very strong	Small.
Alpha Small	348	Medium early.	Dry	Good	Strong	Large.
C. E. F., No. 116	344	Very late	Wet	Poor	do	Small.
Wonder of the World	341	Medium early.	Dry	Good	Medium	Large.
C. E. F., No. 21	341	Late	Fair	do	Strong	Medium.
Brownell's Best	337	do	Dry	do	Medium	Large.
Richter's Schneerose	330	Very late	Wet	Fair	Very strong	do
Genesee Seedling	315	Medium early.	Fair	do	Strong	do
Rosy Morn	311	do			Medium	do
Richter's Imperator	297	Very late	Fair	Good	Very strong	do
Sunrise	293	Early	Dry	do	Medium	do
Crown Jewel	293	Medium early.	do	do	do	do
C. E. F., No 54	293	Late	Fair	Medium	do	Medium.
Snowdrop	282	Medium early.	Dry	Fair	do	Large.
Jumbo	278	Late	Fair	do	do	do
Stray Beauty	267	Early	Dry	Good	do	Medium.
Lady Finger	264	Very late	Wet	Poor	Very strong	do
Main Crop	260	do	Dry	Fair	do	Large.
British Magnum Bonum	256	do	Wet	Poor	do	Medium.
Thorburn's Paragon	256	Medium early.	Dry	Good	Medium	Large.
C. E. F., No. 120	253	Late	Wet	Poor	do	Medium.
Steele's Earliest of All	253	Medium early.	Dry	Good	do	Large.
Thorburn's Late Rose	249	Late	do	do	Strong	do
St. Patrick	245	do	Wet	Poor	Weak	do
Lady Fife	242	do	Dry	Good	Strong	Small.
C. E. F., No. 209	238	do	Fair	Fair	do	Medium.
do 188	238	Medium early.	Dry	Good	Medium	do
Ammon's Early	238	Early	Dry	Good	Weak	Medium.
C. E. F., No. 120	234	Late			Medium	do
Forty Fold	227	Very late	Fair	Fair	do	do
Shah	223	Late	Dry	Poor	Very strong	Large.
Taylor's Prolific	220	Medium early.	do	Good	Weak	do
C. E. F., No. 5	220	Very late	Wet	Poor	Strong	Medium.
Bruce	220	do	do	do	Very strong	do
Rocks	216	do	do	do	Strong	do
C. E. F., No. 141	216	Medium early.	Fair	Fair	Medium	do
Pride of America	216	do	do	do	do	Large.
C. E. F., No. 95	201	Late	do	Good	do	Small.
do 94	201	Very late	Wet	Poor	Strong	do
do 27	187	Late	Dry	Good	Very strong	Medium.
Toronto Queen	165	Medium early.	do	do	Medium	Large.
C. E. F., No 231	161	Late	Wet	Poor	Strong	Small.
Mayatt's Ash Leaf Kidney	139	do	do	do	Weak	Medium.
Leather Hide	135	do	Fair	do	do	do
Village Blacksmith	128	do	do	Fair	Strong	do
Cream of the Valley	117	do	Wet	Poor	do	do

Cattle.

The 15 head consisting of four breeds of cattle imported from Ontario last fall, have all kept in good health, and there has been added to the herd the following calves: one Durham, two Ayrshires, two Holsteins, two Galloways and one Grade.

For future reference an exact record is kept of the yield of milk from each cow of the dairy breeds.

The bulls of the several breeds are well patronized by neighbouring farmers, no less than 71 cows having been served during the year. A charge of two dollars is made, payable at time of service; no difficulty is found in collecting the charges, and farmers appreciate the advantage of having good stock in their neighbourhood.

Feeding Steers on Frozen Wheat and Barley.

The large amount of feed grain in the hands of our farmers during the past year, coupled with the low prices prevailing, makes the question of its feeding value an important one.

With the object of throwing some light on this question, the feeding of a limited number of steers was undertaken last winter on this farm.

The conditions surrounding farmers here are somewhat as follows :—

Many are short of hay but have abundance of clean bright straw and chaff, and are either unwilling or lack the necessary help to grow root crops, but have generally a good supply of coarse grain or damaged wheat.

To meet these conditions the experiments in connection with steers were undertaken with a view of determining the following points :—

1st. If steers can be fattened to advantage on frozen wheat and cut straw without roots or ensilage.

2nd. What advantage, if any, would accrue from the addition of a limited quantity of roots to this ration.

3rd. Can steers be successfully fattened on a ration of barley and straw, combined with a very limited qnantity of hay and roots.

The six steers used for this test were apparently Shorthorn grades, two years old, and were raised by farmers in this neighbourhood; they cost $2\frac{3}{4}$ cents per pound and sold for 4 cents per pound, live weight.

They were divided into three lots of two steers each, and fed for four and a-half months all they would eat clean of the following ration :—

First lot of steers—

	Lbs.
Cut wheat straw	20
No. 3 frozen wheat chop	16

Second lot of steers—

	Lbs.
No. 3 frozen wheat chop	10
Turnips	20
Cut wheat straw	15

Third lot of steers—

	Lbs.
Barley chop	11
Turnips	20
Native hay	6
Cut wheat straw	10

The several ingredients were spread in layers in a heap, and after being moistened were thoroughly mixed and fed the following day, in three feeds.

Feed Consumed.

The total amount and cost of feed consumed during the feeding period (132 days) was as follows :—

First lot of steers—

3,320 pounds cut straw	
2,568 " wheat chop at ½ cent per pound	$12 84

Second lot of steers—

2,865 pounds cut straw	
1,799 " wheat chop at ½ cent per pound	$ 8 99
63 bushels turnips at 5 cents per bushel	3 15
	$12 14

Third lot of steers—

2,270 pounds cut straw	
2,382 " barley chop at ½ cent per pound	$11 91
75 bushels turnips at 5 cents per bushel	3 75
1,320 pounds hay at $5.00 per ton	3 30
	$18 96

Lot No. 1 were "off their feed" several times, and it was quite evident that for the best results some succulent feed should be used, still if this cannot be had, we have proved that it is possible to fatten steers even on frozen wheat and straw alone.

The other two lots were always ready for their feed and their rations were evidently better relished.

Summary of Results.	First cost of Steers.	Cost of Feed.	Price sold for.	Profit.	Daily gain of each Steer.
	$ cts.	$ cts.	$ cts.	$ cts.	
First lot of Steers	49 63	12 84	86 80	24 33	$1\frac{3}{10}$
Second lot of Steers	48 95	12 14	82 60	21 51	$1\frac{7}{100}$
Third lot of Steers	48 80	18 96	91 80	34 06	$1\frac{9}{10}$

The return from the frozen wheat chop fed to lot 1 was equal to 56c. per bushel, while the return from the same wheat fed to lot 2, after deducting the cost of turnips, was equal to 61c. per bushel. The same grade of wheat was selling at 30c. last winter, and is almost unsaleable at any price at this date.

Conclusions.

1st. Although not the most economical way of feeding grain, chop fed frozen wheat mixed with straw alone gave a return of 56c. per bushel, not counting cost of labour.

2nd. If turnips are added to the above ration, they not only pay their cost price but greatly increase the feeding value of the other ingredients.

3rd. Barley chop and wheat straw fed in connection with even a limited quantity of turnips and hay makes an excellent ration, and barley is a grain that we can raise in almost unlimited quantities without risk of injury from frost.

Apple Trees.

Last fall all apple trees were protected either by wrapping with tar paper or canvas and the covering allowed to remain until some time in the following May.

The past winter was an unusually severe one; this coupled with the almost total absence of snow in this portion of the province made it particularly trying on all fruit trees, fourteen varieties were completely killed out and a large proportion of other varieties either killed outright or cut to the ground.

There are, however, a few varieties that came through the winter with little or no injury, the most promising of these are Antonovka, Summer Arabka, Anis, Red Anis and Pointed Pipka; these varieties are so free of injury that I would suggest that additional trees of these sorts be secured for filling vacancies in the fruit plots.

I regret to have to report the almost total loss of the fifty seedling apple trees from imported Russian apple seed. This plot was bare of snow all winter and the trees being too small to protect by the usual methods, nearly all were killed.

The remaining apple trees were well protected with tar paper, &c., this autumn, and as the snow-fall came early and is already quite heavy we may reasonably expect a more favourable season.

Apple Trees formerly tall standards, now grown in bush form.

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Antonovka	5	5	Good	46	24 inches; hardy growth.
Arabka, summer	2	2	Very good	62	15 do extra hardy growth.
do winter	2	2	Fair	36	15 do hardy growth.
Anis	2	2	Good	40	12 do do
do red	1	1	do	36	15 do do
do mottled	1	1	Fair	42	15 do do
Aport	4	3	Good	40	24 do hardy.
Alexander	4	2	Fair	43	32 do do
Blue Pearmain	1	0			
Ben Davis	3	3	Good	36	16 do do
Borovinka	2	2	do	21	8 do do
Canada Baldwin	3	2	Fair	59	22 do doubtful.
Duchess of Oldenburg	4	4	do	42	16 do do
Fameuse	3	3	do	33	17 do do
Gipsey Girl	3	3	Good	57	7 do hardy growth.
Grand Duke Constantine	1	1	do	56	25 do do
Golden White	2	1	do	53	27 do do
German Calville	1	1	Fair	43	33 do doubtful.
Golden Russet	2	1	do	45	33 do kills back.
Grimes' Golden	1	1	do	43	23 do do
Hibernal	4	3	Good	36	15 do hardy growth.
Herren	1	0			
Haas	1	1	Good	58	30 do do
Enormous	1	0			
Bogdanoffs' Glass	1	1	Fair	32	2 do kills back.
Kellogg Russet	1	0			
Lead	2	0			
Livland Raspberry	1	1	Good	43	30 do do
Longfield	4	3	Fair	23	23 do killed to ground, winter 1891-2.
Mann	1	1	Poor	9	9 do do do
McIntosh Red	2	2	do	54	17 do hardy growth.
Pointed Pipka	2	2	Very good	61	21 do extra hardy growth.
Peach	2	2	Fair	42	32 do kills back.
Red Bietigheimer	1	0			

APPLE Trees, formerly tall standards, now grown in bush form—*Concluded.*

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Ins.	
Red Astrachan	2	2	Fair	33	14 inches; kills back.
Steklianka	2	2	Good	48	18 do do
Serinkia	1	1	do	46	24 do hardy growth.
Scott's Winter	1	1	do	44	15 do kills back.
Switzer	2	2	Fair	63	23 do do
Stettin Yellow	1	1	Poor	36	17 do do
Shaker Pippin	2	2	Fair	44	14 do do
Tetofsky	3	3	Good	43	11 do hardy growth.
Titovka	2	2	do	36	16 do do
Talman's Sweet	1	0			
Ukraine	2	0			
Vargul	1	1	Good	28	18 do do
White Borodovka	1	1	do	35	14 do do
Winter St. Lawrence	2	2	Very good	63	23 do do
Wallbridge	1	0			
Wealthy	2	2	Good	62	22 do do
Yellow Transparent	2	1	Poor	28	22 do kills back.

APPLE Trees growing in bush form, on low stems.

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Ins.	
Anisim	4	4	Good	34	14 inches; hardy growth.
Autumn Streaked	5	3	do	25	15 do extra good.
Broad Green	2	2	Extra good	35	14 do hardy growth.
Blushed Calville	3	3	do	25	15 do do
Christmas	2	0			
Cross	2	1	Fair	48	24 do do
Crooked Spice	1	0			
Duchess of Oldenburg	10	9	Good	40	16 do extra hardy growth.
Grandmother	8	7	do	49	18 do do
Krimskoe	1	1	Poor	29	9 do tender growth.
Koursk Anis	3	1	Fair	25	12 do do
Koursk Reinette	1	1	Good	38	18 do hardy.
Karabovka	1	1	Fair	24	11 do doubtful.
Kruder	1	1	do	23	12 do do
Kremer's Glass	1	1	do	30	14 do do
Lejanka, or Liebig	13	12	Extra good	50	22 do very hardy growth.
Osimoe	1	1	Good	40	10 do hardy growth.
Orel, No. 5	1	1	do	45	17 do do
Orel, No. 11	1	1		39	25 do do
Ostrokoff's Glass	3	0			
Pineapple	3	3	Fair	42	13 do hardy.
Plikanoff	9	9	Good	26	15 do hardy.
Repolovka	2	2	Fair	31	10 do hardy growth.
Russian Green	1	0			
Red Repka	4	3	Very good	60	22 do extra hardy.
Romna	6	5	Good	40	9 do hardy growth.
Red Anis	14	14	do	45	21 do do
Sandy Glass	1	1	Poor	28	28 do killed to ground, winter, 1891.
Sugar Sweet	2	1	do	21	8 do doubtful hardy.
Silken	4	4	Good	43	23 do hardy growth.
Simbirsk, No. 1	2	2	do	49	18 do do
do No. 2	1	1	do	45	13 do do
do No. 9	2	2	do	21	13 do do
Tashkin	2	2	do	36	16 do do

APPLE Trees growing in bush form on low stems—*Continued.*

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Tiesenhausen	1	1	Very good	42	19 inches; hardy growth.
Titovka	8	6	do	43	18 do extra hardy growth.
Ukraine	3	2	Good	45	15 do hardy growth.
Vargulek	3	2	do	43	16 do do
White Pigeon	1	1	Poor	12	12 do killed to ground, winter, 1891.
Yellow Arcadian	2	1	Fair	21	19 do doubtful.
Yellow Anis	9	9	Good	38	24 do extra good.
Yellow Sweet	1	0			
Zusoff	2	2		42	19 do

CRAB APPLE TREES.

The experience with apples here generally has not been promising, and I am the more pleased to be able to report a fair amount of success with the hardy varieties of Crab Apples.

Five varieties survived the past severe winter uninjured, and the Transcendant, for the first time, bore a small amount of fruit.

The fruit of this variety would find ready sale here if it is found to grow successfully.

Variety.	Number of Trees. Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Transcendant	9	9	Extra good	72	27 inches; extra hardy, fruited.
Whitney's No. 20	3	3	do	65	20 do extra hardy.
Hyslop	7	7	Good	58	25 do hardy.
Orange	2	1	Fair	59	18 do kills back.
Early Strawberry	2	2	do	40	47 do do
Queen's Choice	1	1	Poor	33	33 do killed to ground, winter of 1891 and 1892.
Lou's Favorite	1	0			
Martha	1	0			

Plums.

Of the eleven varieties of plums remaining in the fall of 1891, four varieties have been killed completely and two others have been cut to the snow line, the De Soto, Early Red, Nicholas and Native will probably prove hardy, the balance will, no doubt, succumb this winter. I am told that the fruit of the native plum varies greatly and that some of it is of excellent quality; if this is found to be the case, a selection should be made and a number of trees propagated from the....

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Bradshaw	2	2	Fair	50	34 inches ; kills back.
Coe's Golden Drop	1	0			
De Soto	2	2	Good	36	12 do hardy growth.
Early Red	7	7	do	42	32 do do
Late Red	1	1	Poor	14	12 do growing from roots.
Marianna	2	0			
Moore's Arctic	1	0			
Nicholas	3	3	Good	69	34 do extra hardy.
Otschakoff	2	2	do	33	30 do killed to snow line.
Trabische	1	0			
Native wild Plum	7	7	Good	72	19 do good.

Cherries.

The few surviving varieties of cherries have done fairly well when the severity of of the past winter is considered, the 6 m and Koslov Bush Morello are quite promising.

Variety.	Number of Trees Living.		Present Condition.	Present Height.	Season's Growth.
	1891.	1892.		Inch.	
Bassarabian	2	1	Fair	17	15 inches ; hardy growth.
Lutovka	5	4	Good	36	14 do do
6 m Cherry	2	2	do	57	18 do do
12 m do	1	0			
Koslov Bush Morello	4	4		23	16 do hardy.

SMALL FRUITS.

Although the success of most large fruits in this country is doubtful, we have the satisfaction of knowing that nearly all small fruits are hardy, free from insect enemies, and, if properly attended to, very productive. All cultivated small fruits bore abundantly this year, and the currant bushes, although young, were loaded with large fruit, and the same may be said of the hardy raspberries and Houghton gooseberries.

Currants.

Particulars of the currants have been arranged in tabular form as follows:

Variety.	Colour.	Size.	Flavor.	Yield of 10 bushes.
				Lbs.
Lee's Prolific	Black	Very large	Excellent	33
Champion	do	Large	Poor	13
Naples	do	Very large	Good	12
Native, large variety	Brown-black	Medium to large.	Strong	
Native, small variety	Jet black	Small	Bitter	8
Raby Castle	Red	do	Good	18
Fay's Prolific	do	Large	do	12½
Victoria	do	do	do	14
Cherry	do	do	do	10
White Grape	White	Very large	Choice	12

Gooseberries.

The Houghton has again proved to be the best variety tested on this farm, it is perfectly hardy and bore well this year; the fruit is however quite small.

Downing has been nearly all winter-killed and is much too tender for this country.

Smith's Improved is fairly hardy, bears large-sized fruit, but is not very productive here.

Native is of course hardy, but the fruit is small and very prickly.

Raspberries.

The following list includes the most promising varieties tried on this farm:—

Turner, a red variety, medium in size, rather soft for shipping, but excellent for home use, quite hardy and with us not benefited by winter protection; rows thinned to hills three feet apart gave larger yield than if left unthinned.

Philadelphia, dark red, medium to small, very prolific, extra hardy here.

Cuthbert, red, large, excellent flavor, not quite as hardy as the two preceeding varieties, but fruit of better quality.

Marlboro, red, extra large, fine flavor, prolific, hardy.

Caroline, yellow, flavor good, rank grower, late, requires protection here.

Forest Trees and Shrubs.

Hardiness of new varieties of forest trees and shrubs received in 1891.

Mention was made in my last report of having received from the east during 1891 a number of trees and shrubs, many of them new to this farm; below will be found full particulars of the hardiness and growth of these.

Variety.	Planted, 1891.	Alive, 1892.	Season's growth, 1892.
Pyrus Aucuparia	50	46	24 inches; hardy.
Pyrus Americana	59	59	36 do do
Alder American	6	2	18 do do
Maple, hard	168	46	6 do half hardy.
Oak (Macrocarpa)	10	4	Small.
Spruce, Black Hill	5	5	do
Red Pine	10	.....	Too tender.
Beech	6	.....	do
Caragana Frutescens	7	4	12 inches; hardy growth.
Berberis Thunbergii	4	4	Small; kills back.
Spiraea	4	.....	
do Californica	5	2	Small; hardiness doubtful.
Ampelopsis Quinquefolia or (American Ivy)	13	10	15 inches; hardy growth.
Honeysuckle, Tartarian red	4	2	Small; hardiness doubtful.
do do black	7	5	do do
Syringa Japonica	5	.....	

An additional supply of fruit and forest trees, shrubs, roses, &c., were received last fall and spring. These will be reported on after passing the ordeal of a winter here.

Avenues.

The Ash-leaf Maple avenues on the farm have thriven exceedingly well, only one tree having died during the year; their growth has been large, and they have preserved a uniform shape with but very little attention. I feel confident that we have excellent material for avenues in this easily obtained tree.

Two of the Ash-leaf Maple trees were attacked shortly after coming into leaf by a light green caterpillar which fed on the tender leaves; the trees were at once sprayed with Paris green and water in the proportion of about a teaspoonful of the Paris green to one part of water. This effectually destroyed the pest.

The avenue on the eastern boundary composed of Ontario White Elm, planted three years ago, has killed down every winter, and last spring Russian Poplars were planted between them; these have nearly all lived and made good growth.

The Native Spruce in the avenues are all living, and are quite ornamental.

The shelter belts on the west side of the farm have made a large growth, and already afford some protection to the farm.

Experiments with Trees as Wind-breaks.

On the treeless prairies of this province the question of wind-breaks is an important one, and it was with pleasure that I received your instructions to devote a number of suitable plots of ground to this purpose.

In the spring of 1891 twelve plots were set apart, and a number of hardy varieties of trees planted for wind-breaks.

As the native Ash-leaf Maple is the most readily obtained tree in most parts of this country, eight plots were devoted entirely to this variety, and for the purpose of ascertaining how far the influence of the shelter will extend, the plots were made of varying widths, and the trees set at different distances apart.

The remaining plots were devoted to a test of other hardy trees for this purpose, set at such distances as were thought to be most suitable for the variety.

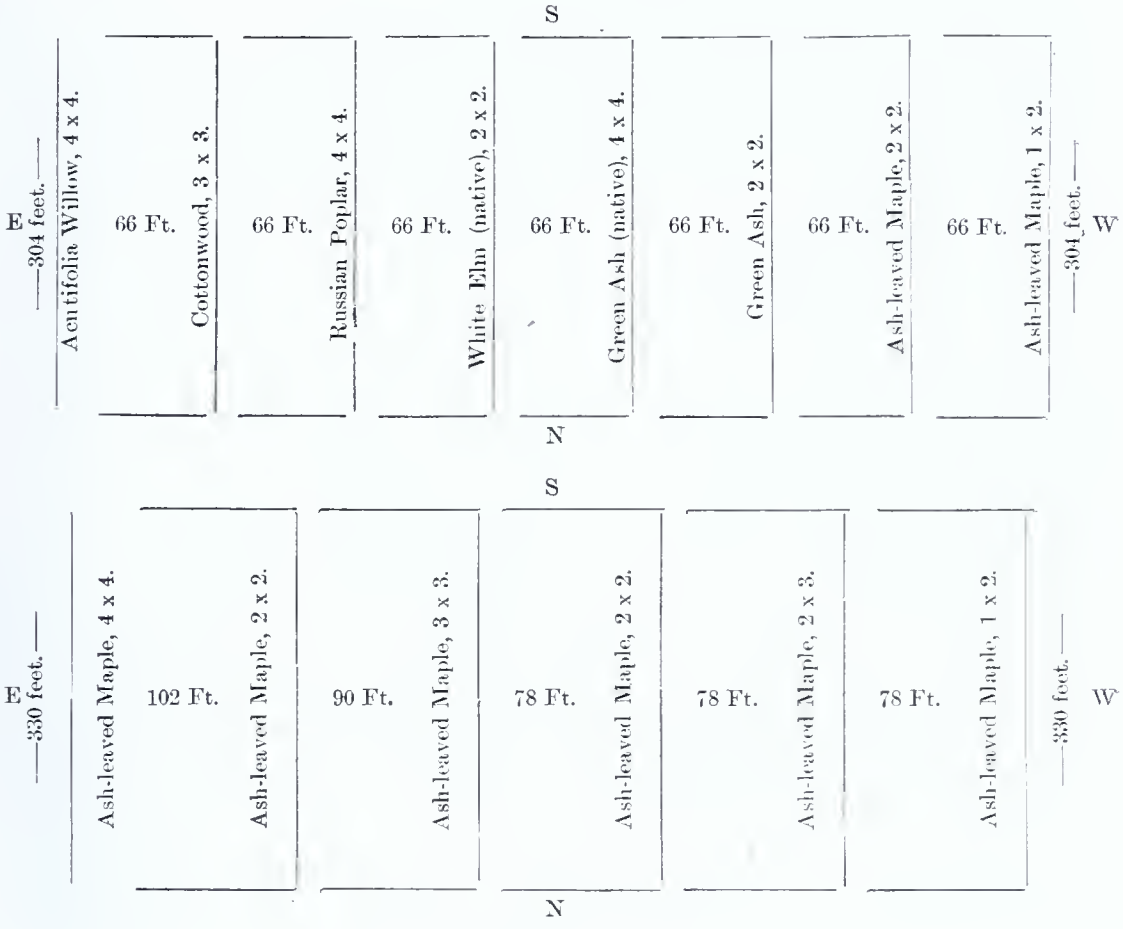
So far the Russian Poplar *(Populus bereolensis)* has made the most growth, and it is already an effective wind-break.

Following this will be found full particulars of these hedges, and the progress they have made to date.

Trees as Windbreaks.

Variety.	Size of Plot in Feet.	Distance apart of Trees.	Average Season's Growth.	Average Height.	Remarks.
			Inches.	Inches.	
Ash-leaf Maple	78×330	1×2	26	48	Healthy growth.
do	78×330	2×3	30	53	Appears to have done the best.
do	78×330	2×2	31	57	Healthy growth.
do	90×330	3×3	22	43	Low spot; damaged by water.
do	102×330	2×2	30	58	Healthy.
do	304×66	4×4	15	39	Low spot; damaged by water.
do	304×66	1×2	14	36	Light growth; very much exposed to wind.
do	304×66	2×2	10	38	do do
Native Green Ash	304×66	2×2	8	22	Slow growth at first.
do	304×66	4×4	8	22	do
Native White Elm	304×66	2×2	17	29	Very healthy.
Russian Poplar (bereolensis)	304×66	4×4	31	68	Excellent; already a good wind break.
Cottonwood	304×66	3×3	30	.....	Thin; from cuttings that did not strike well.
Willow (Salix acutifolia)	304×66	4×4	28	63	Very healthy and even growth.

PLAN showing arrangement of Shelter Belts; the openings, leading into and out of each plot are 12 feet wide, otherwise the plots are entirely surrounded by the wind break.



TREE DISTRIBUTION.

The distribution of hardy forest tree seedlings and cuttings from this farm has largely increased during the past year, over fifty thousand were applied for, as this number exceeded our supply, applications for ten thousand were held over and will be filled next spring.

Many favourable reports have been received from parties supplied with trees in 1890 and this branch of the farm work is greatly appreciated especially by farmers settled on the unsheltered prairies.

All the trees and cuttings sent out last year were grown on the Experimental Farm and over fifty thousand have been prepared for next spring's distribution.

The packages were sent by mail and contained one hundred trees and cuttings as follows :

Variety.	Number.	Variety.	Number.
Ash-leaf Maple	42 trees.	Willow Laurifolia	1 cuttings.
Nativé White Elm	6 do	Poplar bereolensis	7 do
Green Ash	1 do	do Petrovsky	8 do
White Birch	2 do	do certinensis	1 do
Artemisia abrotans	3 cuttings.	do alba argentea	1 do
Willow Voronesh	15 do	do Wobstii Riga	1 do
do acutifolia	2 do	Cottonwood	10 do

Vegetables

CORN FOR TABLE USE.

Ten early varieties of corn were sown in hills on adjoining plots, of these the Squaw corn is decidedly the earliest variety tried, but the flavour is poor and the ears short, the Cory, Pearce's Superior and Mitchell's Extra Early are good varieties, and will mature sufficiently for the table in an average season.

Variety.	When sown.	In tassel.	Fit for eating	Number of days maturing for table use.
				Days.
Squaw Corn (native)	May 30	July 22	August 17	79
Pearce's Superior	do 30	do 28	do 23	85
Early Cory	do 26	August 1	do 21	87
Stowell's Evergreen	do 30	do 6	do 27	89
Mitchell's extra early	do 26	do 1	do 27	93
Pop Corn	do 26	July 28	do 29	95
Marble head	do 26	August 4	do 29	95
Crosby's Early Sugar	do 30	.....	Sept. 6	99
Perry's Hybrid	do 30	.....	do 10	103

Garden Pease.

Nineteen varieties of garden pease were grown on the farm this year.

The Horsford market garden pea was one of the best of the early varieties, being early, productive and of good flavour.

The Telephone is an excellent late variety.

The accompanying table gives particulars of these varieties; all were sown on 11th May in rows three feet apart, the yield given is of ripe pease, the produce of one row 132 feet long :—

GARDEN PEASE.

Variety.	Earliness.	Flavor.	Size.	Colour.	Surface.	Yield from 132 feet.
						Lbs.
American Wonder	Extra early.	Good	Medium	Blue	Wrinkled	7½
Blue Imperial	Early	do	Large	do	Smooth	12
Beck's Gem	do	do	Medium	White	do	9
Bliss' Abundance	do	do	Large	Blue	Wrinkled	12
Carter's First Crop	Extra early.	do	Small	White	Smooth	11
Duke of Albany	Medium	Very good	Large	Blue	Wrinkled	8
Extra Early Star	Early	Fair	Small	White	Smooth	9
Extra Early Dwarf Brittany	Late	do	Medium	do	do	14
First and Best	Early	do	do	do	do	11½
Horsford's Market Garden	do	Good	Large	Blue	Wrinkled	13½
Kentish Invicta	Extra early.	Fair	Small	do	Smooth	6
Laxton's Alpha	do	Good	Medium	do	Wrinkled	10½
Laxton's Supreme	Early	do	do	do	do	12
McLean's Blue Peter	do	Poor	Large	do	Smooth	8½
Pride	Medium	do	do	White	do	10½
Rennie's No. 10	Late	do	do	do	do	17
Steele Bros. Extra Early	Early	Fair	Small	do	do	6
Stratagem	Medium	Good	Large	Blue	Wrinkled	8
Telephone	Late	do	do	do	do	10

Garden Beans.

Thirty-six varieties of garden beans were tested on the Experimental Farm this year.

All were sown on 31st May, with a garden drill, in rows three feet apart, very few varieties were fully ripe when cut down by frost on 10th September.

The following failed to ripen any seed whatever, Emperor William, California Sugar Bean, Scarlet Runners, New Bush Lima, New Golden Andalusian Wax, Red Speckled, Horticultural, Giant Red Wax and Cluster Wax.

Below will be found particulars of each variety arranged in the order of their maturing :—

GARDEN BEANS.

Variety.	Condition, time of first Frost.	When ripe.	Yield on 66 feet of Row.	
			Lbs.	Oz.
Early Yellow, six weeks	Ripe	Sept. 5	2	2½
Dwarf German White Wax	do	do 5	1	1
Golden Wax	do	do 5	2	
Large Yellow, six weeks	do	do 7	2	14
Early Dun-coloured	Nearly all ripe		4	3
Ne Plus Ultra	do		3	
Black-eyed Wax	do			15
Sugar Grey	50 per cent ripe		3	6
Early China	50 do		2	9
Flageolet Wax	50 do		3	12
Dwarf German Black Wax	50 do			9
Mammoth Red German Wax	50 do		1	1
Negro Extra Early	25 do		3	7
Crystal White Wax	Few ripe		1	6
Early Mohawk	do		3	4
Sugar Pearl Predome	do		3	4
Yosemite Mammoth Wax	do		1	
Black Speckled	Green		2	2
One hundred to one	do		2	3
Royal Dwarf Kidney	Very green		1	2
Black Long Podded	do		1	8
Canadian Wonder	do		1	4
Large Podded	do		3	
Crown Horse Bean	Fully ripe ; 2 ft. 9 in. in height.		7	2

Rhubarb.

Owing to the great scarcity of cultivated fruit in this province, rhubarb, or pie plant, is valued more highly than in the Eastern Provinces, and large quantities are used.

Althought this plant is not supposed to come true from seed, it is more convenient to mail seed than roots, and it was thought advisable to ascertain whether good varieties could be obtained by this means ; seed from five varieties were sown in the open ground in the spring of 1891, and moved to permanent location the following spring, although this is only the second year from seed it will be seen that the returns are already large.

Many complaints are received from farmers that rhubarb has not succeeded with them, on examination it is found that the plants are either smothered with weeds, the soil impoverished or the plants have been growing too long in one spot.

The plants should be moved to a new location every four or five years, be kept free from weeds and heavily manured each year.

RHUBARB.

Variety.	Date of Sowing Seed.	Circumference of Stalk.	Weight per Hill.	
		Inches.	Lbs.	Oz.
Victoria	1891	4¾	10	
Johnston St. Martin	1891	4½	7	6
Myatt's Linnaeus	1891	5	6	4
Stotts Mammoth	1891	5	4	4
Carleton Club	1891	4	3	3
Tottles Improved	From roots.	5½	11	6

Farmers Institute Meetings.

During the past year the following Institute meetings were attended by invitation, and the papers mentioned read by me; in many cases samples of grain threshed and in the straw, were shown at the meetings, which added much interest to the subject and served to explain some of the features of the work carried on at the farm.

Virden, 29th January.—Two sessions, full house each time; subject, "Varieties of Grain."

Brandon, 16th January.—Good attendance; subject "Sowing Grain."

Brandon, 30th January.—Large attendance; subject, "Varieties of Grain."

Wawanesa, 26th February.—Good attendance; subject, "Fodder for Dairy Cows."

Bradwardine, 19th February.—Packed meeting; subject, "Varieties of Wheat and Grasses."

Minnedosa, 12th March.—Fair attendance; subject, "Grain Growing."

Elkhorn, 19th March.—Full house; subject, "Results of Experiments in Grain Growing."

Killarney, 25th March.—Same subject, fair attendance.

Melita, 2nd June.—Same subject, small attendance.

Bradwardine, 4th June.—Subject, "Trees and Flowers."

Shoal Lake, 28th June.—Small attendance; subject, "Grain and Grasses."

Birtle, 28th June.—Large attendance; subject, "Varieties of Grain."

Souris, 5th July.—Good attendance; subject, "Summer Fallow."

New Buildings, &c.

A much needed poultry building has been built during the year; it is 16 x 32 feet, and has compartments for four breeds of fowls. With the object of keeping it at a moderate temperature without artificial heat, the spaces between the studs have been filled with soft or broken bricks laid in mortar. In my next report I hope to be able to speak favourably on this experiment.

A windmill has also been erected on the cattle barn, and is used for pumping water, grinding grain, cutting feed, &c., and has so far given satisfaction.

Working Expenses.

Although a larger number of plots of grain have been sown this year than in any previous season and much additional work undertaken in connection with the care of stock, I am pleased to be able to report that the working staff on the farm has been reduced and the working expenses generally lessened, this result has been possible owing to the land being in a better condition and requiring less work and to the ease with which the past year's crop was harvested.

Samples for the World's Columbian Expcsition.

On the 9th of November last, five thousand pounds of vegetables consisting of thirty-eight varieties of field roots and sixty-six varieties of potatoes besides a number of jars containing fruit and garden vegetables grown on this farm, were shipped to Chicago to be kept there in cold storage until the Exposition opens.

In addition some hundreds of samples of grain both threshed and in the straw have been prepared ready for use in the Canadian Exhibit.

Owing to the press of work in connection with the preparations for this Exposition none of the local Agricultural Exhibitions could be attended this year.

Visitors.

As the Experimental Farm is becoming better known and more accessible by the opening up of new lines of railway the number of visitors increase: this year 4,703 visited the farm, an increase of 1,183 over last year.

The large numbers of visiting delegations from the Eastern provinces and from the United States was a feature of the past year and the farm is credited with materially assisting immigration by showing what crops can be grown here under proper cultivation.

On August 2 the Brandon Farmers Institute held a pic-nic at the farm, and over five hundred from the surrounding country availed themselves of the opportunity to examine the work in progress.

Correspondence.

The correspondence in connection with the work of the farm is constantly increasing and the number of letters received in 1892 reached 2,433, while 2,449 were sent from the farm: the above includes 697 circular letters sent in connection with tree distribution.

I have the honour to remain, sir,

Your obedient servant,

S. A. BEDFORD,
Superintendent.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF A. MACKAY, SUPERINTENDENT.

INDIAN HEAD, N.W.T., 31st December, 1892.

WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you herewith my fifth annual report of work done on the North-West Experimental Farm during the year 1892.

In some respects the season just past has been a great improvement on its predecessor. Although the growth was backward at first, when the June rains came, everything made rapid progress and harvest was much earlier than was at one time thought possible.

The harvest was everything that could be desired. The weather continued fine, almost without a break from first to last, and farmers were enabled to cut their crops without an hour's delay.

Drawing and stacking were quickly and satisfactorily done, and the cutting and threshing has been got through with a comparatively small amount of expenditure of money or labour.

Little or no harm was done by frost to standing grain. In many districts everything was in stook long before frost came; in others, some late patches of oats were slightly injured.

The sample of wheat all over the Territories is exceptionally fine, but unfortunately the yield has not been equally good. In some districts the average is fair, in others poor. On the Experimental Farm the wheat crop has given fair returns. Winds and early spring frosts injured the more tender varieties, causing them to give a small yield. The Indian sorts were short in the straw and the yield small.

Very little barley was grown in the Territories last season, but where grown, if properly put in on well-worked ground, the yield and quality have been good. The growth of straw was short, but the heads were large.

On the Experimental Farm the crop was short in straw, but returned a fair yield of plump, bright barley.

Oats as a general thing have been a light crop throughout the North-West Territories, caused chiefly from their being sown late on stubble land, that may have had two or more crops of wheat preceding them and not sufficient rain for that mode of farming. The yield from the different varieties tested on the Experimental Farm, has been much below the returns from the same varieties in 1891, and the sample is not so good. Rust struck nearly all the sorts before they were fully matured causing the grain to be somewhat shrunken.

Pease, like barley, are grown to a very small extent in the country. On the Experimental Farm a fair return has been obtained from all the varieties tested, and never before has the sample been so fine, large and uniform.

For roots and vegetables the season was not so favourable as 1891. Although the growing season was longer there was not nearly as much rain. Potatoes, perhaps, are an exception, for everywhere the crop has been a good one.

For tree culture, the year just past has been the best since the farm started. Although very little has been done in foreign sorts, for the reason of their failing

repeatedly to stand our climate; a few that have lived through the past four years, have this year shown considerable vitality and give promise of yet becoming trees. The native trees never did better and with their well matured season's growth will no doubt go through this winter better than ever before.

Special attention was again given to fodder and grass cultivation. For fodder, the season was not as good for quantity as 1891, but better for quality. For grass cultivation, the season was anything but favourable. A hard winter succeeded by a cold backward spring, killed or greatly weakened the varieties with few exceptions. Heavy winds completely destroyed all new sown plots, and when the season was over very little was obtained for the time and trouble spent. One variety *Bromus inermis*, gives promise of being a most excellent grass for the North-West. This variety stood the winter and backward spring without the loss of the least vitality and when the other grasses were hovering between life and death, it was making a good growth and was ready to cut when the best of the others was only heading out. Not growing extra high, it made a heavy thick growth at the bottom and will no doubt be a good pasture as well as hay grass.

Before giving in detail the results of the different tests made with grain and other products of the farm, permit me to refer to two matters of great importance to North-west settlers, if to none others, namely : 1st. The unwise manner of sowing grain ; 2nd, Smut.

The general observation of everyone travelling through the country last summer was, that wherever crops were put in in good order, they were looking well and when the land was not well worked quite the reverse was the case. Such has been the experience for the past ten years, with one exception, that of last year, in which owing to plenty of rain, the poorest worked land gave as good, if not better returns than the best. The yield of land worked as our soil must be to give regular and satisfactory returns, has borne out the observations of travellers. We have in this district and I doubt not, in others also, farmers who have this year from 30 to 40 bushels per acre on fallow land, while, on their stubble land, equally good soil only 8 to 15 bushels. Granted that a good sample of grain is sometimes obtained from stubble land and that such land matures the grain in a shorter period than fallow ; still the risk is very great. The reason of injury to stubble crops is the want of sufficient moisture in the soil to carry the grain over the hot period. Stubble land, whether ploughed in the fall or spring or sown without ploughing at all never has sufficient moisture to carry a crop to maturity unless the June and July rains are in excess of ordinary years. In fallow land, if properly worked sufficient moisture has been stored up to mature grain in the driest year and farmers in the Territories should have every year at least two-thirds of their crop on fallowed land. Not only do settlers risk too much crop on stubble land at its best ; that is, after ploughing and sowing in the very best manner ; but thousands of acres are put in in the second, third, and even the fourth year, without ploughing a furrow. The stubble is burned off, if possible, and the grain sown by drill and not touched again until cut. This mode of farming may in one year out of ten give a fair crop on good heavy soil ; but on light land with a gravelly or a poor sub-soil, the chances are against it producing even a medium crop at any time.

It has before, in my annual report, been pointed out that fallowed land, in a surprising manner, stores up and retains moisture enough to carry grain through the hottest and driest summer. Fallow-land, may in a wet season have too much moisture, causing rank growth of straw instead of quickly maturing the grain, yet our wet seasons are so few in comparison to the dry ones, that the risk is at most only two years out of ten. (1884 and 1891 being the only wet seasons since 1881.) Besides fallows can be made to retain less moisture by putting less work on them. One good ploughing in the months of June or July and surface cultivation afterwards to keep down the weeds, instead of two ploughings will hold less moisture and cause the grain to ripen four to six days earlier. This applies to heavy soil—in lighter land with gravelly or poor subsoil, two ploughings and plenty of surface cultivation should be given—The ploughings should be as deep as possible. On the Experimental Farm, three ways were followed in 1891, in working our fallows : 1st. Ploughing deeply early in the spring and afterwards keeping the weeds down by surface cultivation. 2nd. Ploughing three inches deep first, surface

cultivation afterwards to keep down the weeds, and after harvest ploughed deeply. 3rd. Gang ploughing in the spring and fall with shallow surface cultivation between. Of the three modes the first is recommended for heavy soil, and the second for light land but instead of three inches deep, the land should be ploughed six inches deep at first. The third way ripened the grain four days earlier than the other two but the yield was less.

Another most important point to consider by those farming in the North-west Territories, is Smut, which causes untold loss to the country. Although this enemy of wheat was less prevalent the past season than in 1891, few localities, if any, were entirely free from it. That it can be overcome by treating the seed with bluestone, no matter how badly affected the seed may be, is almost a certainty. It is however, absolutely necessary that the seed be treated properly. In tests made on the Experimental Farm, the past year, the best results were obtained by mixing the bluestone with sufficient water, so that when put over the seed there was enough to thoroughly wet every grain and keep it wet for several hours. In the small plot tests ($\frac{1}{10}$ acre), the same quantity of bluestone was used per bushel as in the field tests, but mixed with more water; and the small plots invariably gave the best results and the least Smut. In the small plots, also, the worst smutted wheat that could possibly be obtained, was used for seed, while the larger plots were sown with seed almost entirely free from it. For the larger plots one pail of water was used to ten bushels of seed; for the smaller plots $1\frac{1}{2}$ pails to ten bushels.

Wheat Tests.

Forty-eight varieties of wheat were tested on the farm the past year, from plots of one-tenth of an acre up to 15 acre fields. In addition to these 6 cross-bred sorts crosses between Ladoga and Red Fife, and White Fife were tested. Nearly the same line of experiments in wheat testing was carried on, as in 1891. The test of sowing the same variety of wheat on the same day of each week for six weeks, gave results very much the same as in 1891. The best results were given by plots sown late in April or early in May. This, no doubt, is accounted for by the spring of both years opening out early and fine and afterwards becoming cold and backwards for several weeks, with heavy frost on a number of nights which not only put back all early sown grain, but killed many of the tender roots.

The last plot of Campbell's White chaff, sown on 20th May, was ripe four days earlier than the first plot, sown on 15th April, and in the Red Fife the 1st, 2nd, 3rd and last sown plots were ripe on the same day. No variety of wheat out of the 48 tested has proved in the past year to be worthy of special notice for earliness and quality combined. While several were extra good in quality they were not much earlier than Red Fife and those that were early were too deficient in hardness and quality to rank with Red Fife. White Connell, a variety much like White Fife, Red Fern, a bearded wheat; Campbell's Triumph, Johnston's wheat and Wellman's Fife were all good. Ladoga, although a fair sample, and returning a fair yield was badly rusted like many of the other kinds. The Indian wheats were all very short in straw and gave a poor yield. It may be desirable to sow some of these sorts another year, more with the intention of crossing them with Red Fife and others, than with the expectation of their proving worthy of future general cultivation.

Test of Different dates of Sowing.

In this test Red Fife and Campbell's White Chaff wheats were used. Commencing on 5th April, each variety was sown on fallowed land, every seven days up to 20th May, excepting on 29th April, when on account of hard frost for several days it was impossible to do anything on land. Campbell's White Chaff is a soft wheat some days earlier than Red Fife and yields rather better. In the Red Fife plots little or no difference could at any time be seen; the first and last sown ripened together. In the Campbell's White Chaff plots the last sown ripened first, though the second sowing

gave the best return. The following is the result the size of the plots was one tenth of an acre.

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Condition.	Weight of Grain and Straw.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. in.				
Red Fife	April 15	May 18	July 25	Sept. 7	145	3 8	No rust.	510	27·40	63
do	do 22	do 20	do 25	do 7	138	3 8	do	510	30·	63
do	do *29									
do	May 6	May 23	July 25	Sept. 7	124	3 8	No rust.	540	35·40	63
do	do 13	do 25	do 25	do 5	115	3 8	do	500	33·	63
do	do 20	do 31	do 25	do 7	110	3 8	do	610	26·20	62
Campbell's White Chaff.	April 15	do 18	do, 25	do 5	143	3 9	Rust on leaves.	540	29·40	60
do do ..	do 22	do 20	do 25	do 5	136	3 9	do	525	38·	60
do do ..	do *29									
do do ..	May 6	May 23	July 25	Sept. 4	121	3 9	Rust on leaves	630	28·50	61
do do ..	do 13	do 25	do 23	do 2	112	3 10	do	640	36·40	61
do do ..	do 20	do 31	do 25	do 1	104	3 9	do	660	33·20	60

* Did not sow on account of frost.

Field Tests.

A field of 25 acres was divided in 5 acre lots and sown with Ladoga, Red Fern, White Fife, White Connell and Campbell's White Chaff. The 4 last named were sown on 15th April. The Ladoga 5 acres, being very wet was not sown until 19th April.

Red Fern and White Connell being thought good wheats for the North-west it was deemed advisable to test them alongside Ladoga and Campbell's White Chaff, two of our earliest wheats and White Fife, a late variety. The result, so far as earliness is concerned, need not be taken into consideration as the backward spring caused the 5 sorts to come in within a few days of one another.

Varieties.	Acres.	Sown.	Came up.	Headed.	Ripe.	Height.	Matured in	Yield per Acre.	Weight per Bush.
						Ft. In.	Days.	Bush.	Lbs.
Ladoga	5	April 19..	May 17..	July 22..	Aug. 25..	3 6	128	27·30	62
Red Fern	5	do 15..	do 17..	do 20..	do 25..	3 8	132	32·30	62
White Fife.....	5	do 15..	do 17..	do 17..	do 26..	3 4	133	26·00	63
White Connell.....	5	do 15..	do 17..	do 18..	do 26..	3 4	133	28·00	62
Campbell's W. Chaff	5	do 15..	do 17..	do 16..	do 22..	3 8	129	32 00	61

Half acre tests.

Seven varieties of wheat having done well last year, both in yield and quality, were this year sown alongside one another to more thoroughly test them. For comparison, three very early Indian Wheats were also sown at the same time. The land was fallow and in good order. In earliness, the Indian Wheats were first in earliness but were poor

in straw, yield and sample. The Australian, Campbell's Triumph and Chilian White were best in quality and yield.

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Condition.	Yield per Acre.	Weight per Bush.
					Days.	Ft. In.		Bush.	Lbs.
Golden Drop	April 18	May 20	July 26	Aug. 29	133	3 6	Rusted	20·30	62
Australian	do 18	do 18	do 18	do 25	128	3 6		29·02	62
Judket	do 18	do 18	do 20	do 30	134	3 6		28·00	59½
Campbell's Triumph	do 18	do 18	do 18	do 25	128	3 6		26·05	60
Defiance	do 18	do 18	do 18	do 31	135	3 6		26·00	61
Wellman's Fife	do 18	do 18	do 19	Sept. 3	138	3 9		27·40	61½
Chilian White	do 18	do 20	do 18	Aug. 25	128	3 6		29·10	61
Ind. Hd. Calcutta	do 18	do 20	do 8	do 20	124	2 0		15·06	63
Delhi	do 18	do 20	do 8	do 20	124	2 0		18·30	61½
Karachi	do 18	do 20	do 10	do 22	126	2 0		14 38	63½

Test of Different Varieties Sown on Same Date.

ONE-TENTH ACRE PLOTS.

Twenty-six varieties of wheat were sown on same day, on fallow land. All were sown by drill at the rate of 1½ bushels per acre. This experiment was made to find out the earliest and best sorts for future trial. In the 26 kinds are included three Indian wheats for comparison as to earliness. As will be seen, not one of the varieties can claim much this year on the score of earliness. Campbell's Triumph and Ladoga taking the lead by only two days over Red Fife but 15 days behind the Indian sorts. In yield and quality Red Fife, Azima Russian, Assiniboia, Red Fern, Pringles Champlain, Johnston's, White Connell, and Campbell's Triumph are the best. The Indian wheats in this, as in all other tests were very short in the straw and gave a very small yield of rather poor grain.

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Condition.	Weight, grain and straw.	Yield per acre.	Weight per bush.
					dys.	ft. in.			bush.	lbs.
White Connell	Apr. 19	May 20	July 23	Sept. 9	143	3 8		475	29·40	62
Gehun	do 19	do 20	do 10	Aug. 18	121	2 6	Rusted		17·30	64
Genessee	do 19	do 20	do 23	Sept. 5	139	3 8	Badly rusted	480	26·10	62½
Old Red River	do 19	do 20	do 25	do 7	141	3 9		420	26·00	60
Campbell's Triumph	do 19	do 20	do 23	do 3	137	3 6	Rusted	490	26·17	60
Club	do 19	do 20	do 25	do 5	139	3 0		400	21·40	61
Waugh's Delhi	do 19	do 20	do 28	do 10	144	3 2		300	13·20	62
Johnston's	do 19	do 20	do 23	do 8	142	3 4		420	31·30	61
Blue Stem	do 19	do 22	do 25	do 10	144	3 8		460	26·40	58
Red Fife	do 19	do 20	do 24	do 5	139	3 8		520	33·20	62
White Fife	do 19	do 21	do 23	do 5	139	3 8		495	25·40	63
Russian Hard Tag	do 19	do 20	do 23	do 7	141	3 6		490	30·00	62
Club Bombay	do 19	do 20	do 10	Aug. 16	119	3 9		420	21·00	64
Colorado	do 19	do 20	do 23	Sept. 5	139	3 8	Badly rusted	360	21·30	62½
French Imperial	do 19	do 22	do 25	do 7	141	3 9		450	28·30	62½
Carter's Cross-Bred F	do 19	do 20	do 28	do 9	143	4 0	Badly rusted	540	25·00	58½
Ghirka, Russian	do 19	do 21	do 27	do 10	144	3 9	do	480	25·00	61½
Azima, Russian	do 19	do 21	do 25	do 9	143	3 8	do	550	33·20	63½
Assiniboia	do 19	do 20	do 25	do 5	139	3 9	do	565	34·30	61
Anglo-Canadian	do 19	do 20	do 26	do 5	139	3 8	do	515	22·50	59½
Red Fern	do 19	do 20	do 25	do 5	139	3 9		520	32·00	62
Pringle's Champlain	do 19	do 20	do 24	do 5	139	3 9	Rusted	490	31·50	63
Saxonka	do 19	do 20	do 24	do 5	139	3 8	do	540	27·50	62½
Ladoga	do 19	do 20	do 25	do 3	137	3 9	do	450	26·50	62
Indian Hard Calcutta	do 19	do 22	do 8	Aug. 16	119	2 0		240	12·50	63
Rio Grande	do 19	do 23	do 26	Sept. 9	143	3 9			28·00	60½

Test of Sowing Different Quantities of Seed per Acre.

In this test Red Fife was used and sown on the 20th April. The different quantities had the same chance. Contrary to expectation the plot with the smallest quantity of seed ripened one day earlier than the plot with the largest quantity and gave exactly the same return. Little or no difference could be seen at any time, in the four plots and had there been no dividing space it would have been impossible to say which had the smallest quantity of seed.

Varieties.	Quantity.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per Bush.
	Bush. per acre.					Days.	Ft.	in.	Bush.	Lbs.	Lbs.
Red Fife	1	April 20	May 20	July 25	Sept. 8	141	3	9	28	20	62
do	1¼	do 20	do 20	do 25	do 9	142	3	9	28		62
do	1½	do 20	do 20	do 25	do 8	141	3	9	26	30	62
do	1¾	do 20	do 20	do 25	do 9	142	3	9	28	20	62

Test of Sowing at Different Depths.

Red Fife was again used in this test and as will be seen 2 inches deep gave the best result.

In 1891 the best return was obtained from sowing 1 inch deep. On account of less surface moisture this year 1 inch deep was not sufficient. Below is the result :—

Varieties.	Depth.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per bush.
	In.					Days.	Ft.	in.	Bush.	Lbs.	Lbs.
Red Fife	1	Aprl 20	May 20	July 26	Sept. 9	142	3	8	24	30	62
do	2	do 20	do 21	do 26	do 7	140	3	9	27		62
do	3	do 20	do 22	do 26	do 10	143	3	9	22	20	62

Test of Sowing Different Ways.

The press-drill in this test gave better results than the ordinary drill or broadcast, but it is the only test in which the Press has come out ahead. All the plots were somewhat hurt by winds and the broadcast showed the effects through the entire season.

Variety.	How Sown.	Sown.	Came Up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per bush.
						Days.	Ft.	in.	Bush.	Lbs.	Lbs.
Red Fife	Broadcast	May 12	May 26	July 25	Sept. 9	120	3	8	20	20	62
do	Press-drill	do 12	do 23	do 25	do 3	114	3	8	30	20	62
do	Drill	do 12	do 25	do 25	do 6	117	3	8	24		62

Test of Sowing Good and Frozen Seed.

Our best Red Fife seed, also some of our No. 1 frozen Red Fife, with Nos. 2 and 3 frozen, obtained outside the farm, were used in this test. No. 2 was obtained from a grain-buyer and No. 3 from a farmer who was unable to sell at any price. All were sown within two hours of each other on exactly the same worked land, the soil the same and all matured nearly together.

The yield, however, is greatly in favour of the frozen seed. Last year No. 3 frozen gave 38·10, and good seed 32·40 per acre ; this year No. 2 frozen gives the best yield, 36·40, though No. 3 frozen is not far behind—33·20, with good seed only 23·40 per acre. These extraordinary and unlooked for results are very difficult to account for.

Variety.	Kind of Seed.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per Bushel.
							ft.in.	Bush.	Lbs.
Red Fife..... ...	No. 1, hard ...	April 20	May 19	July 25	Sept. 8	141	3.8	23·40	62
do	No. 1, frozen..	do 20	do 20	do 25	do 8	141	3.8	30·30	62
do	No. 2, do ..	do 20	do 23	do 25	do 9	142	3.8	36·40	62
do	No. 3, do ..	do 20	do 26	do 25	do 8	141	3.8	33·20	62

Tests of Wheat on Stubble Land.

The land used for these tests had a crop of Red Fife in 1891, and had been fallowed the year before. The stubble was burned off, and four ways followed in sowing, viz. Drill, press-drill, gang-plough and disc-harrow. No work whatever was put on the drilled and press-drilled plots, except sowing the seed with the drills. In the third plot the seed was sown broadcast on the burnt ground, and the plot then ploughed 3 inches deep with a three-wheeled gang-plough, and one stroke of the harrow given after. The same process was followed on the fourth plot, except that a disc-harrow was used instead of the gang-plough. Little or no difference was observed at any time in the plots. The plot sown by press-drill ripened two days earlier than the others.

Different Ways of Sowing on Stubble.

Variety.	How sown.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per Bushel.
						days.	ft.in.	Bus. lbs.	Lbs.
Red Fife.....	Drill.....	May 16	May 26	July 20	Aug. 29	105	3.4	22·30	62
do	Press-drill	do 16	do 26	do 19	do 27	103	3.4	22·	62
do	Gang-plough..	do 16	do 29	do 21	do 30	106	3.4	20·30	62
do	Disc harrow .	do 16	do 29	do 21	do 29	105	3.4	21·40	62

Test of Land treated with different quantities of Superphosphate of Lime.

Some parties having expressed through the press the opinion that superphosphate of lime would hasten the ripening of grain, a quantity was obtained from Ottawa and sown on five plots of one-tenth acre each, in different quantities, and one plot sown without treatment. No difference could be observed in the growth of the plots, and very little in the maturing, but the five plots treated were given the benefit of the doubt. When threshed, an increase in yield was found in favour of the treated: the largest quantity of superphosphate of lime giving the largest number of bushels.

Variety.	Super phosphate per acre.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Weight of Grain and Straw.	Yield per Acre.		Weight per Bushel.
							Ft. In.		Bush.	Lbs	Lbs.
Red Fife.....	100 lbs	May 6..	May 23.	July 26.	Sept. 8..	125	3 9	260	30	20	61
do	200 do	do 6 .	do 23.	do 26.	do 8..	125	3 9	240	32	40	61
do ..	300 do	do 6..	do 23.	do 26.	do 8..	125	3 9	270	31	20	61 1/2
do	400 do ...	do 6..	do 23.	do 26.	do 8..	125	3 9	280	32	..	61 1/2
do	500 do	do 6..	do 23.	do 26.	do 8..	125	3 9	290	34	20	62
do	Untreated.	do 6..	do 23.	do 26	do 9..	126	3 9	280	29	20	61

Test of Wheat on Root and Corn Land—twelve acres.

In this test the land used had a crop of roots, corn, potatoes and millet the year before. The millet and root land were each ploughed half in the fall and the remainder in the spring. The other land was gang-ploughed in the spring. The seed was sown and gang-ploughed in. On account of this field being greatly exposed to the winds, the grain was longer in maturing than almost any other on the Farm.

Variety.	Kind of Land.	When ploughed.	How sown.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per Acre.		Weight per Bus.
								Days.	Ft. In.	Bus.	Lbs.	Lbs.
Red Fife....	Millet..	Fall....	Drill ..	April 14	May 16.	July 17.	Aug. 25.	133	3 9	27	30	62
do	do ..	Spring..	Ganged.	do 14	do 16.	do 17.	do 25.	133	3 9	27	30	62
do	Turnip .	Fall....	Drill ...	do 6	do 16.	do 18.	do 27.	143	3 8	32	10	62
do	do .	Spring..	Ganged.	do 5	do 16.	do 18.	do 27.	144	3 8	32	10	62
do ..	Corn....	do ..	do .	do 4	do 16.	do 18.	do 25.	143	3 8	33	40	62
do	Mangel.	do ..	do .	do 6	do 16.	do 18.	do 27.	143	3 8	30	..	62
do	Potato..	do ..	do .	do 6	do 16.	do 19.	do 27.	143	3 8	32	50	62

Smut Tests.

The seed grain for these tests was obtained from an elevator in town, and was unsalable on account of its smuttiness. Three parts were treated at the rate of 1 pound of bluestone to 5, 7 and 10 bushels of seed, and mixed with 1½ pails of water for 10 bushels. The seed was spread out on the barn floor; the mixture sprinkled over it and the wheat thoroughly stirred. One plot was sown with the seed untreated. Six feet square was accurately cut and every head within this area counted, with the results given. The plots sown with seed treated, 1 pound to 5 and 7 bushels were practically free from smut, the plots sown with seed treated 1 lbs. to 10 bushels had so little that when the

grain was threshed it was free from any sign of smut, except an odd ball; while the untreated was nearly $\frac{1}{4}$ smut and like the seed unsalable. The yield was also 6 bushels less per acre. After counting the heads the remainder of each plot was cut to obtain yield per acre. No farmer would think of sowing seed as badly affected with smut as was the seed used in this test and with care in treating ordinary seed each spring, little or no smut will result.

Variety.	How treated.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Smutted heads.	Good heads.	Yield per acre.	Weight per bush.
						Days.			Bus. Lbs.	Lbs.
Red Fife..	Untreated..	April 22	May 21	July 26	Sept. 9	140	207	957	19·10	57
do ..	1 lb. blue stone, 10 bushels wheat..	do 22	do 23	do 26	do 9	140	11	1,454	24·00	61
do ..	1 lb. blue stone; 7 bush. wheat.....	do 22	do 23	do 26	do 9	140	1	1,466	25 20	61½
do ..	1 lb. blue stone; 5 bush. wheat..	do 22	do 23	do 26	do 9	140	2	1,146	25 50	61½

In treating the seed for field lots, one pound of bluestone was used to 5, 7 and 10 bushels of seed, the same as in the one-tenth acre plots, but only one pail of water was used instead of one and one-half pails. This did not moisten the seed sufficiently to allow the bluestone to kill the germs of smut on all the grains, and hence some smut was found in the grain.

Cross-bred Wheats.

Six cross-bred wheats, produced by Professor Saunders, Ottawa, crosses between Ladoga and Red and White Fife, were sown again this year. They suffered considerably from winds, were late in ripening and gave a poor return. Enough was obtained, however, to sow nearly one-tenth acre next season, when they will be more thoroughly tested.

Mr. A. P. Saunders was sent by the director to the Indian Head Farm at the proper season where he cross-fertilized a number of different varieties of wheat and other grain. The crosses made with wheats are chiefly between the early ripening Indian wheats and Ladoga, with Red Fife and Campbell's White Chaff.

It is hoped that good results will be gained from crosses made in this climate.

Following are the names of cross-bred wheats sown this year with their parentage :—

(Bearded)	Carleton.....	Ladoga	female and	White Fife	male.
do	Beta.....	do	do	Red	do
(Bald)	Alpha.....	do	do	White	do
(Bearded)	Prince.....	do	do	do	do
do	Abundance.....	do	do	Red	do
do	Ottawa.....	do	do	do	do

Fall Wheats.

In the fall of 1891 four varieties of fall wheat were sown in September. These all came above ground before winter came on, but were entirely killed in the spring. The same varieties were again sown on 28th October, just before the ground froze up, and of course did not germinate. The seed was sown by drill, and put down from $2\frac{1}{2}$ to 3 inches.

In the spring the grain was slow in germinating and made poor progress all season; was very thin, and when threshed gave small yields of only medium grain. Along with

the fall wheats was sown a spring variety—Ladoga—which did little or no better than the fall sorts. The result of tests of grain sown on 28th October is given below.

Varieties.	Sown.	Headed.	Ripe.	Yield per Acre.	Weight per Bushel.
				Bush.	Lbs.
Early Red Clawson	Oct. 28, '91..	July 14, '92..	Aug. 25.....	12	59½
Democrat	do 28, '91..	do 14, '92..	do 25.....	15	60½
Manchester	do 28, '91..	do 14, '92..	do 25.....	14	60½
Royal Prize	do 28, '91..	do 14, '92..	do 25.....	16	60½
Ladoga (Spring)	do 28, '91..	do 14, '92..	do 25.....	14½	61

Barley Tests.

Twenty-two varieties of barley were sown the past year. Most of these have been tested for several years and may be regarded as suitable for the Territories. Very little difference can be observed in the Chevalier family, as all do well. Two old varieties, Golden Melon and Thanet, which for the past three years have done well, have this year done much better than usual, especially in quality, Prize Prolific has given the largest yield, followed closely by Sharp's Improved. Duck-bill, which has heretofore given the best results, this year is not so good. The six-rowed varieties gave small yields the past season, and the sample is also small.

To find out the best time to sow barley, the test of sowing on the same day for six weeks in succession was followed. Two varieties of two-rowed barley were used, viz., Goldthorpe and Kinver Chevalier.

The first sown was on the 18th of April, the earliest practicable date. The third should have been on the 2nd of May, but the ground being covered with snow, it was impossible to do anything in the way of seeding for three days, and this date was consequently missed.

It will be seen that early seeding was not suited to the cold backward spring. The first seeding of both varieties was well up when the cold, frosty weather of 1st May came, and in consequence, not only were the young blades cut down, but one-half of the plants were entirely killed. This left the plots so thin and weak that they took eleven days longer to mature. The best yield was from sowing on the 16th of May, and the last sowing, that of the 23rd of May, matured in 45 days less time than the first sowing.

This result corresponds closely with test made in 1891, on the same line, as both springs were nearly alike; opening out early in April and toward the close becoming cold, with heavy frosts at night. The results are given below:—"Land fallowed in 1891, seed sown by drill at the rate of two bushels per acre, on one-tenth acre plots."

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Condition.	Height.	Weight of Grain and Straw.	Yield per Acre.	Weight per Bushel.
					Days.		ft. in.	Lbs.	Bush.	Lbs.
Goldthorpe	Apr. 18	May 18	July 28	Sept. 10	145	Blown	2 10	.....	18·40	48
do	do 25	do 21	do 27	do 5	133	Rusted	2 10	430	34·24	51
do	May *2									
do	do 9	May 23	July 27	Sept. 3	117	No rust.	2 10	370	30·10	51
do	do 16	do 27	do 25	Aug. 31	107	do ..	2 10	360	36·00	51
do	do 23	June 4	do 25	do 30	99	do ..	2 10	330	31·06	51
Kinver Chevalier	Apr. 18	May 18	do 27	Sept. 9	144	Rusted	2 8	475	35·40	50
do	do 25	do 21	do 27	do 5	133	do	2 10	515	41·12	52
do	May *2									
do	do 9	May 23	July 27	Sept. 5	115	No rust.	2 10	470	41·32	53
do	do 16	do 27	do 26	Aug. 31	107	do ..	2 10	510	46·32	53
do	do 23	June 4	do 25	do 30	99	do	2 9	515	44·22	52

* Did not sow on account of frost.

Field Lots.

The three varieties chosen for this test were Duck-bill, California Prolific and Prize Prolific, all two-rowed sorts. The crop of straw was short, being only about one-half the ordinary height of these grains. Winds repeatedly swept over the field and retarded the growth and so thinned one-half of the Duck-bill portion, that it was cut before maturing and made into hay.

"Sown on fallow, by drill, at the rate of $1\frac{3}{4}$ bushels per acre."

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.	Weight per Bushel.
					Days.	ft.	in.	Bush.	Lbs.
Duck-bill	Apr. 26	May 18	July 27	Aug. 29	125	2	8	31·12	50
California Prolific	May 7	do 21	do 21	do 29	114	2	8	43·36	51
Carter's Prize Prolific	do 7	do 21	do 21	Sept. 6	122	2	9	49·28	51

Half-acre Lots.

Ten sorts were sown in half-acre lots, consisting of two new and eight old varieties. It was intended that all should be sown on the same day, but frost and snow delayed the seeding of four varieties ten days later than the first six sorts sown.

"Sown by drill at the rate of $1\frac{3}{4}$ bushels per acre on fallow."

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.		Yield per Acre.		Weight per Bushel.
					Days.	Ft.	In.	Bush.	Lbs.	
Kinver Chevalier	April 26	May 20	July 28	Sept. 5	132	2	8	41	32	54
Beardless	do 26	do 20	do 28	do 5	132	2	9	40	30	52
Thanet	do 26	do 20	do 28	do 4	131	2	8	43	36	53
Improved Chevalier	do 26	do 20	do 29	do 6	133	2	8	30	10	52
California Prolific	do 26	do 20	do 23	do 3	130	2	9	30	40	51
Peerless	do 26	do 20	do 28	do 6	133	2	8	38	36	$51\frac{1}{2}$
English Malting	May 7	do 23	do 27	do 5	121	2	9	39	38	54
Mensury	do 7	do 23	do 18	Aug. 23	108	2	9	36	14	50
Baxter's Six-Rowed	do 7	do 23	do 18	do 20	105	2	9	33	16	$51\frac{1}{2}$
New Golden Grains	do 7	do 23	do 28	Sept. 10	126	2	8	35	28	51

One-tenth Acre Plots.

Wishing to test as many varieties as possible sown on same date; 13 sorts were chosen and sown on summer-fallow by drill at the rate of $1\frac{3}{4}$ bushels per acre in plots of one-tenth of an acre with the following results :—

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bush.
					Days.	Ft. In.	Bus. Lls	Lbs.
Baxter's 6-Rowed	May 5	May 22	July 25	Aug. 24	111	2 9	29 28	51½
Prize Prolific	do 5	do 22	do 27	Sept. 9	127	2 8	48 20	51
Peerless	do 5	do 22	do 27	do 9	127	2 8	41 12	51½
Selected Chevalier	do 5	do 22	do 27	do 9	127	2 8	35 20	51½
New Zealand	do 5	do 22	do 25	do 9	127	2 8	33 16	51½
Thanet	do 5	do 22	do 27	do 9	127	2 8	43 16	53
Golden Melon	do 5	do 22	do 27	do 7	125	2 8	48 36	52
Improved Chevalier	do 5	do 22	do 27	do 7	125	2 4	37 44	52
Large 2-Rowed Naked	do 5	do 22	do 16	Aug. 22	109	2 2	22 44	61
Spiti Valley Naked	do 5	do 22	do 14	do 20	107	2 8	20 20	62
Mensury	do 5	do 22	do 23	do 24	111	2 9	33 16	50
Sharp's Improved	do 5	do 22	do 26	Sept. 5	123	2 6	49 10	52
Rennie's Improved	do 5	do 22	do 23	do 5	123	2 8	41 32	51½

Test of Sowing Superphosphate of Lime.

This test was undertaken for the purpose of ascertaining whether the addition of super phosphate of lime to the soil would induce early ripening. Two plots of one-tenth of an acre each were sown with Duck-bill Barley. On one plot 500 pounds superphosphate of lime was sown with the seed. No difference in length of straw or earliness could be observed, but when the plots were threshed the one with the superphosphate of lime gave 7·24 bushels more per acre. Both plots were injured by wind.

Sown by drill, on fallow, at the rate of one and three-quarter bushels per acre.

Variety.	Treatment.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Yield per acre.	Weight per bush.
						Dys	Bus. Lls.	Lbs
Duck-bill	Without fertilizer	May 7	May 27	July 27	Sept. 9	125	29 08	50
do	500 lbs. per acre.	do 7	do 27	do 27	do 9	125	36 32	51

Oats Test.

Twenty-five varieties were tested; six of which had not been tried on this farm before. Heavy frosts in the latter part of April and first week in May did much harm to all the plots early sown and winds afterwards injured late sown plots, several being entirely killed. Almost all varieties were struck by rust some days before ripening and consequently are much lighter in weight than last year. On account of the very unfavorable season for oats no variety has come out so far ahead as to be worthy of special mention although the Prize Cluster and American Banner gave on the whole the best

results. Some sorts like American Beauty, American Triumph, Early Blossom and Early Etampes were conspicuous by their inability to stand a cold spring, they being entirely killed.

Test of different Dates of Sowing.

In this test Prize Cluster and American Banner were the varieties chosen. The land had been fallowed, was in good order and free from weeds : seed was sown by drill at the rate of 2½ bushels per acre. Like the wheat and barley tests, it was impossible to sow on the 3rd date on account of frost and snow. As will be seen below, the last seedings were the first to mature :

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Condition.	Weight of grain and straw.	Yield per acre.	Weight per bush.
					Ds.	Ft. in.		Lbs	Bush.	Lbs
Prize Cluster	April 18	May 20	July 27	Sept. 8	143	3 6	Rusted	280	25·00	40
do	do 25	do 23	do 21	Aug. 29	126	3 6	do	395	47·22	40
do	*May 2									
do	do 9	May 25	July 22	Aug. 29	112	3 6	Rusted	360	44·04	42
do	do 16	do 28	do 20	do 22	98	3 8	Not rusted	370	45·10	42
do	do 23	June 4	do 21	do 20	89	3 8	do	390	52·32	41
do	do 30	do 8	do 23	do 22	84	3 8	do	360	45·20	39
American Banner	April 18	May 20	July 27	Sept. 2	137	3 8	Rusted	300	38·18	39
do	do 25	do 23	do 25	do 5	133	3 8	do	380	51·6	40
do	*May 2									
do	do 9	May 25	July 25	Sept. 3	117	3 8	No rust	360	51·15	40
do	do 16	do 28	do 23	Aug. 27	103	3 8	do	390	51·6	40
do	do 23	June 4	do 24	do 29	98	3 8	do	460	59·24	40
do	do 30	do 10	do 25	Sept. 1	94	3 8	do	360	60 20	39

* Did not sow on account of frost.

Field Lots.

Six varieties were sown in a field of thirty acres. The field had been fallowed the year before, being gang ploughed in the spring and ploughed again later in the season 7 inches deep. Two and a-half bushels of seed were sown per acre. The whole field was greatly hurt by the heavy frost early in May and never sufficiently recovered to give a good crop. The following is the result :—

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bushel.
					Days.	Feet. in.	Bus. Lbs.	Lbs.
Prize Cluster	Apr. 21	May 21	July 25	Aug. 29	130	3 6	46 26	44
Cream Egyptian	do 22	do 23	do 25	do 30	130	3 6	42 22	41
American Beauty	do 22	do 23	do 27	Sept. 8		Cut for silo		
Winter Grey	do 22	do 23	do 27	do 6	139	3 8	38 00	41½
Black Champion	do 22	do 23	do 28	do 10		Cut for silo		
Can. Triumph	do 22	do 23	do 28	do 6		do		

Test of Varieties on one-half acre Plots.

Ten varieties were sown on same date on one-half acre plots of fallow. Seed was sown by drill at the rate of two bushels per acre. Two of the new varieties were killed out, being unable to stand the severe frost shortly after they were sown.

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in.	Height.	Yield per acre.	Weight per bushel.
					Days.	Feet. in.	Bus. Lbs	Lbs.
Early Etampes	Apr. 21	May 21	.....	Killed by frost and wind.	.....	.....	.....	.....
Abundance	do 21	do 21	July 23	Sept. 8	140	3 6	29 14	36½
English White	do 21	do 21	do 23	do 5	137	3 6	42 22	36½
Royal Doncaster	do 21	do 23	do 27	do 6	138	3 8	38 28	37
Bonanza	do 21	do 23	do 18	Aug. 18	119	3 8	35 10	40
California Prolific Black	do 21	do 23	.....	Killed by frost and wind.	.....	.....	.....	.....
Joanette	do 21	do 23	July 21	Sept. 7	139	3 0	42 22	36
Giant Cluster	do 21	do 23	do 25	do 7	139	4 0	41 34	33½
Improved Ligowo	do 21	do 21	do 21	do 5	137	3 4	25 30	40½
White Russian	do 21	do 23	do 23	do 6	138	4 0	42 22	38½

Test of one-tenth acre Plots.

Thirteen varieties were sown on the same day on fallow land at the rate of 2½ bushels per acre. Though sown one day earlier than the one-half acre plots, all stood fairly well except Early Blossom which has in several previous tests succumbed to cold weather. Winter Grey which last year gave the best results was very poor this year both in this and in other tests made with it.

The following are the results of this test :—

Varieties.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Weight of Grain and Straw.	Yield per Acre.	Weight per Bushel.
					Days.	Ft. In.	Lbs.	Bush. Lbs.	Lbs.
Bonanza	April 20	May 23	July 23	Sept. 1	134	3 6	330	36 10	40
Winter Grey	do 20	do 23	do 27	do 1	134	3 10	350	34 6	41½
Early Gothland	do 20	do 23	do 29	do 9	142	3 10	.....	25 30	40
American Beauty	do 20	do 22	do 27	do 9	142	3 9	310	36 16	38½
Swedish	do 20	do 23	do 22	Aug. 25	127	3 4	380	57 16	37
Welcome	do 20	do 23	do 23	do 25	127	3 8	410	44 00	43½
Canadian Triumph	do 20	do 23	do 22	do 22	124	3 10	410	48 00	41
Cream Egyptian	do 20	do 23	do 23	do 24	126	3 4	410	40 00	41
Early Blossom	do 20	do 23	do 29	Sept. 3	.....	3 8	Cut for ensilage.		
English White	do 20	do 23	do 27	do 3	136	3 8	210	38 8	36½
Banner	do 20	do 23	do 27	Aug. 29	131	3 10	430	39 24	38
Archangel	do 20	do 23	do 22	do 23	125	3 4	350	43 28	37
Prize Cluster	do 20	do 23	do 27	Sept. 3	136	3 6	390	45 00	44

The tests of " Different Quantities per acre ; Different depths of seeding and Different ways of sowing " were badly injured, by winds and are not reliable for comparison.

Test of treatment with Superphosphate of Lime.

Two plots of Prize Cluster, one-tenth acre each, were sown ; one of which had superphosphate of lime sown with the seed in the proportion of 500 pounds per acre. No difference could be seen in earliness but a marked difference will be observed in the yield as given below.

Variety.	Treatment.	Sown.	Came up.	Headed.	Ripe.	Matured in	Height.	Yield per Acre.	Weight per Bushel.
						Days.	Ft. In.	Bush. Lbs.	Lbs.
Prize Cluster	Untreated	May 6	May 26	July 23	Sept. 2	119	3 10	34 14	42
do	500 lbs. per acre	do 6	do 26	do 23	do 2	119	3 10	41 26	44

Test of Pease.

Thirty-nine varieties of field and garden pease were tried last season. Although the crop of straw was short, the yield was fairly good, and the sample extra fine.

Test of Field with Garden Varieties.

Nine varieties of field and three of garden pease were sown alongside one another on plots of one-tenth acre. The land had been fallowed and was in good order. Pease were sown at the rate of two and a-half bushels per acre of the small varieties and three bushels of the larger sorts. The result is as given below :—

Varieties.	Kind.	Sown.	Came up.	Podded.	Ripe.	Matured in.	Yield per Acre.	Weight per Bushel.
						Days.	Bus. Lbs	Lbs.
Champion of England	Field	May 7	May 28	July 20	Aug. 26	111	16 40	60
Prussian Blue	do	do 7	do 28	do 22	do 29	114	28 20	67
Prince Albert	do	do 7	do 28	do 18	do 29	114	28 20	64
Extra Early	do	do 7	do 28	do 14	do 19	104	23 20	64
White Marrowfat	do	do 7	do 28	do 22	do 29	114	25 00	65
Black Eyed do	do	do 7	do 28	do 22	do 30	115	20 00	63
Mummy	do	do 7	do 28	do 18	do 28	113	28 40	64
Multiplier	do	do 7	do 28	do 22	do 29	114	26 40	64
Crown	do	do 7	do 28	do 22	do 29	114	25 00	65
Stratagem	Garden	do 7	do 28	do 18	do 29	114	13 20	60
Yorkshire Hero	do	do 7	do 28	do 14	do 26	111	20 00	60
Pride of the Market	do	do 7	do 28	do 22	do 26	111	20 40	63

Summer Fallow *vs.* Sod, Spring Ploughed.

Two sorts of pease were sown on fallow land and the same on a piece of grass sod (timothy and clover) ploughed just before seeding.

As will be seen there was not much difference in yield but considerable in the date of ripening :—

Varieties.	Land.	Sown.	Came up.	Podded.	Ripe.	Matured in.	Yield per Acre.	Weight per Bushel.
						Days.	Bus. Lbs	Lbs.
Mummy	Summer fallowed	May 7	May 28	July 18	Aug. 28	113	28·40	64
Crown	do	do 7	do 28	do 22	do 29	114	25	65
Mummy	Sod	do 9	do 28	do 18	do 22	105	26	64
Crown	do	do 9	do 28	do 18	do 20	103	26·20	65

Test as to Earliness and Quality for Table use.

Twenty-eight varieties were sown in small plots to test them for earliness and quality for table use. The sixteen first mentioned below proved to be the earliest, and the following the best in quality:—Yorkshire Hero, Champion of England, Stratagem, Pride of the Market, Duke of Albany, American Wonder, McLean's Little Gem and Heroine.

By sowing at same time American Wonder for early, Yorkshire Hero for second early, and Champion of England for late, a good succession of table pease may be obtained.

The following varieties were sown :—

Varieties.	Sown.	Came up.	Podded (used.)	Ripe.	Matured in.
					Days.
Bliss' American Wonder	May 7..	May 26..	July 3..	Aug. 16..	101
Extra Early Premium Gem	do 7..	do 26..	do 3..	do 16..	101
Carter's First Crop	do 7..	do 26..	do 5..	do 16..	101
McLean's Little Gem	do 7..	do 26..	do 6..	do 16..	101
Extra Early	do 7..	do 26 .	do 7..	do 16..	101
Kentish Invicta	do 7..	do 26..	do 12..	do 16..	101
American Wonder	do 7..	do 26..	do 5..	do 16..	101
Tom Thumb	do 7..	do 26..	do 7..	do 16..	101
McLean's Blue Peter	do 7..	do 26..	do 10..	do 16..	101
First and Best	do 7..	do 26..	do 7..	do 16..	101
Extra Early Star	do 7..	do 26..	do 7..	do 16..	101
Early Kent	do 7..	do 26..	do 10..	do 18..	103
Yorkshire Hero	do 7..	do 26..	do 14..	Sept. 1..	117
Pride of the Market	do 7..	do 26..	do 14..	Aug. 23..	108
Stratagem	do 7..	do 26..	do 18..	Sept. 4..	120
Telephone	do 7..	do 26..	do 18.	do 3..	119
Duke of Albany	do 7..	do 26..	do 20..	do 3..	119
Extra Early Dwarf Brittany	do 7..	do 26..	do 22..	do 3..	119
Blue Imperial	do 7..	do 26..	do 22..	do 1..	117
Laxton's Alpha	do 7..	do 26..	do 14..	do 1..	117
Bliss' Abundance	do 7..	do 26..	do 18..	do 1..	117
Champion of England	do 7..	do 26..	do 22..	do 3..	119
Horsford's Garden	do 7..	do 26..	do 18..	do 3..	119
Pride of the North	do 7..	do 26..	do 18 .	Aug. 23..	108
Laxton's Supreme	do 7..	do 26..	do 20..	Sept. 3..	119
No. 10	do 7..	do 26..	do 22..	do 1..	117
Heroine	do 7..	do 26..	do 22..	do 6..	122
Stanley	do 7..	do 26..	do 14..	do 6..	122

Fodder Mixtures.

Various mixtures of grain were sown last spring for fodder, the principal ones being rye, barley and oats. Wheat with other grains last year gave the largest yields but was found when it came to be used to be very coarse and did not make as good hay as barley and oats. This year except in two plots, wheat was not used. Rye, the past season did not make a good mixture with other grain. On account of cold weather keeping back the barley and oats, it was ready to cut ten days before either of the others and consequently the crop came in very unevenly.

Two plots of barley and rye were sown on fallow land on 5th May and cut on 18th July. The rye produced in cured hay 4,800 lbs. and the barley 5,860 lbs. per acre.

Barley and oats were mixed and sown on stubble land which had a crop of wheat the previous year, on May 23rd and cut on August 24th, yielding 2 tons 700 lbs per acre.

On May 16th, oats and barley were sown on stubble land. One plot was gang-ploughed 3 inches deep, a second plot disc-harrowed and the third sown by drill without

being worked in any way. On the first two the seed was sown before ploughing or disc-harrowing was done. The yield of hay from the different plots was as follows :—

Varieties.	Land.	Sown.	Came up.	Cut.	Yield per acre of cured hay.
					Lbs.
Oats and barley	Ganged	May 16	May 30	Aug. 2	2,800
do	Disc-harrowed	do 16	do 30	do 2	2,900
do	Drilled	do 16	do 28	do 2	3,130

On 25th May, six plots were sown on stubble land. One plot was sown by drill with pease mixed with oats. Another plot was sown with the same two varieties, but they were put in separately, which in the end did not make much difference.

The yield of fodder, when cured, on the different plots with dates of seeding, &c., is given below :—

Varieties.	How sown.	Sown.	Came up.	Cut.	Yield per acre.
					Lbs.
Pease and oats	Together	May 21	June 3	Aug. 2	2,130
do	Separate	do 21	do 3	do 2	2,460
Wheat and oats	Together	do 21	do 3	do 2	2,500
Wheat, oats and barley	do	do 21	do 3	do 2	2,550
Rye and barley	do	do 21	do 3	do 2	2,400
Rye and oats	do	do 21	do 3	do 2	2,500

A small field of rye alone was sown on May 23rd and cut for hay on July 18th, yielding $1\frac{3}{4}$ tons per acre. It was again cut on Sept. 15th, giving for the second crop 2,613 lbs. per acre.

Fodder Corn.

Fourteen varieties were tested last season on land which had been fallowed the year previous and before seeding was well ploughed, harrowed and rolled, everything being done to ensure a good crop if it were possible to obtain one. The corn was sown in drills, three feet apart with a common seed drill. After coming above ground a scruffler was used every week until the crop was well advanced. The corn when cut was run through a cutting box and put in the silo. As will be seen, the crop was very light, chiefly owing to repeated wind storms during its early growth.

Varieties.	Sown.	Came up.	Tasselled.	Cut.	Height.	Yield per Acre.
					feet.	Tons. Lbs.
Mitchell's Extra Early	May 27	June 18	Aug. 8	Sept. 9	$4\frac{1}{2}$	6 430
Pride of the North	do 27	do 18	do 24	do 9	$4\frac{1}{2}$	7 960
Crosby's Early Sugar	do 27	do 18	do 24	do 9	$4\frac{1}{2}$	7 300
Smut-Nosed-Flint	do 27	do 18	do 24	do 9	$4\frac{1}{2}$	8 390
Angel of Midnight	do 27	do 18	do 24	do 9	$4\frac{1}{4}$	8 280
Red Cob Ensilage	do 27	do 18	do 28	do 9	$4\frac{1}{4}$	6 430
Long-fellow	do 27	do 18	do 28	do 9	$4\frac{1}{2}$	9 700
Mammoth Sweet	do 26	do 22	do 28	do 9	$4\frac{3}{4}$	6 760
Mammoth Southern Sweet	do 27	do 18	do 24	do 9	5	8 1,930
Pearce's Prolific	do 27	do 18	do 24	do 9	$4\frac{1}{2}$	11 220
Thoroughbred White-Flint	do 27	do 18	do 8	do 9	5	9 1,030
Dakota	do 27	do 18	do 8	do 9	5	8 1,930
Cinquantine	do 27	do 20	do 24	do 9	$5\frac{1}{2}$	6 230
Early Cory	do 27	do 20	do 24	do 9	$4\frac{1}{2}$	4 500

Millets, &c.

Different plots of millets were sown on fallow and stubble-land, but all, except one or two plots were of little account. The result is as follows :—

Varieties.	Land.	Sown.	Came up.	Cut.	Yield per Acre.	
					Tons.	Lbs.
Common Millet	Fallow..	May 26	June 18	Sept. 15	2	326
Hungarian Grass	Fallow..	do 26	do 18	Hurt by winds.	Plowed up.	
Hungarian Grass	Stubble.	do 26	do 18	Sept. 15		1,800
Common Millet	Stubble.	do 26	do 18	do 15	1	600
Golden Millet	Stubble.	do 26	do 18	do 15	1	
Hungarian Grass and Millets	Rootla'd	do 31	do 24	do 15	2	38
Millet Long (large heads)		do 31	do 24	do 15		1,900

In the early part of the season, the growth of the millets was greatly retarded by winds.

Grasses and Clovers.

As before stated, last winter and fall were very severe on grasses and clovers. Out of the nineteen cultivated varieties sown in the spring and summer of 1891, not one had sufficient vitality this spring to produce a crop. Most of the plots were entirely killed ; others, such as Lucerne and Meadow Fescue, which have given fair crops in other years, failed the past season. Mixtures of grasses sown with grain in 1891, and which made a good growth in that year and gave every promise of a crop, were, except in low spots where the snow lay last winter, very poor. This field, of five acres, was mown several times during the season to thicken up what grass remained, and extra seed sown in bare spots.

In small plots, in a somewhat protected place, three varieties of Bromus came through safely. One of these, the Austrian brome grass, Bromus inermis, is a very promising grass. Long before the other sorts had started it was growing fast, and was ripe when the best of the other two was heading out. It made a very thick growth at the bottom, and also grew a good length. Bromus pumpellianus and Bromus segetum also made a fair growth. Muhlenbergia glomerata, Muhlenbergia Mexicana and Muhlenbergia sylvatica stood the winter, but made a small growth. The past season more native grass-seed was sown and less of the cultivated sorts. The following grasses and clovers were sown in small plots last spring :—Lucerne, Mammoth Clover, Red Clover, Alsike Clover, Bokhara, Crimson, White Dutch, Meadow Fescue, Orchard Grass, Kentucky Blue Grass, Red Top, Canadian Blue Grass, Sheep Fescue and Timothy. As much seed of the best native sorts was sown as it was possible to obtain, and although a good deal has been destroyed, a considerable quantity has come through.

Rye.

Spring rye was sown early in the spring (6th April) on fallow, for seed, and returned 20·20 per acre. Rye was also sown late in May (26th) on stubble land, which was gang-ploughed three inches deep, and was sown by drill, yielding 18·30 per acre, showing that rye is a safe crop to sow either early or late.

Flax.

Two plots of flax were sown, one of which was entirely killed by winds ; the other giving 10 bushels of seed. Fibre Short.

Roots.

The past season has not been as favourable for roots as was that of 1891. On the Experimental Farm the tests made with carrots and mangels were entire failures. Twelve varieties of carrots were sown on the 19th and 26th of May, and though both seedings came up they were completely destroyed by winds. Twelve varieties of mangels were put in on 26th May and 2nd June, but like the carrots were destroyed. Although somewhat injured, turnips fared better than the carrots or mangels. Thirteen varieties were sown on 28th May and 2nd June. The land had been fallowed the year previous and a heavy coating of manure was applied and ploughed in after the spring work was over and the ground well harrowed. Two ways were followed in sowing the turnips, on the flat and on drills. In both ways the plants came up equally well and little or no difference could be observed between them, until they came to be pulled, when it was found that those sown on the flat were very rooty and hard to pull, very much more so than those sown on the top of the drill. The following are the varieties sown, date of sowing, pulling and yield per acre :—

Varieties—First Sowing.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Purple Top Swede	May 28	June 10	Sept. 20	852
Selected Purple Top	do 28	do 10	do 20	374
Jumbo	do 28	do 10	do 20	365
Carter's Prize Winner	do 28	do 10	do 20	634
Sutton's Champion	do 28	do 10	do 20	456
Carter's Elephant	do 28	do 10	do 20	488
Marquis of Lorne	do 28	do 10	do 20	460
Purple Top	do 28	do 10	do 20	436
Bangholm Improved Purple Top	do 28	do 10	do 20	414
Elephant	do 28	do 10	do 20	406
Bronze Top Extra	do 28	do 16	do 20	414
Mammoth Purple Top	do 28	do 10	do 20	396
Hartley's Bronze	do 28	do 10	do 20	444

Varieties—Last Sowing.	Sown.	Came up.	Pulled.	Yield per Acre.
				Bush.
Purple Top Swede	June 2	June 14	Sept. 20	672
Carter's Elephant	do 2	do 14	do 20	636
Bronze Top Extra	do 2	do 20	do 20	630
Jumbo	do 2	do 14	do 20	630
Sutton's Champion	do 2	do 14	do 20	638
Hartley's Bronze	do 2	do 14	do 20	392
Bangholm Improved Purple Top	do 2	do 14	do 20	584
Marquis of Lorne	do 2	do 14	do 20	440
Carter's Prize Winner	do 2	do 14	do 20	660
Purple Top	do 2	do 14	do 20	632
Selected Purple Top	do 2	do 14	do 20	740
Mammoth Purple Top	do 2	do 14	do 20	572
Elephant	do 2	do 14	do 20	600

Nine varieties of turnips and of mangels and thirteen of carrots were planted last year for their seed. Although the crop of seed was poor, enough has been obtained to thoroughly test the value of home-grown seed next season.

PITTING ROOTS IN FIELD.

Having in the fall of 1891 a large quantity of turnips that it was impossible to find room for in the root-cellars in the barn, they were put in a long pit in the field in the usual Ontario way. The bottom was five feet wide and the turnips tapered to a point on top. The turnips were first covered with a layer of straw three inches thick, then earth three inches thick, and just before freezing up a second layer of straw was put on two inches thick, and a second covering of earth four inches deep. Early in the winter a coating of coarse manure was put over all. Openings were left every ten feet until heavy frost came, when they were closed up. The turnips came out in the spring in very fine condition, not one being rotten or in any way spoiled.

A small pit of potatoes was also put out in the same way as the turnips, except that a hole was dug two feet deep and filled up to top and then covered. On account of there being too few potatoes in the pit, those in the top half were frozen and spoiled, but those at the bottom were perfectly sound.

This fall the turnips required for feeding next spring were pitted in the same maner as in 1891. A large quantity of potatoes were also pitted in the same way except that the pit was dug four feet wide and three feet deep, and the potatoes put in even with the top and covered the same as the turnips.

Potatoes.

Seventy-six varieties were grown the past year and a good crop was obtained from almost all the sorts. The tubers were a fair size but very scabby which may be accounted for by the ground having had a heavy coat of manure before planting, although last year's crop was grown on ground as heavily manured and the potatoes were perfectly free from scab. The land had been fallowed the year previous and well harrowed before planted. Drills three feet apart were opened and sets dropped every fourteen inches. As the plants came above ground it was well harrowed and a scruffler run through each week until the vines covered the ground, when they were ridged up with a plough. Commencing on the 19th August, two hills of each variety were taken up, counted and weighed, each week until the 16 September. The number and weight of each variety in two hills on the first and last testing are giving below.

Tests of sixty-five varieties are given, the remaining eleven not being kept.

Potatoes planted 21st May: taken up 3rd October.

Varieties.	Came up.	Growth.	Matured.	Size.	Weight. (2 rows, 66 feet.)	Bushels per Acre	August 19th.			September 16th.		
							Marketable.	Small.	Weight.	Marketable.	Small.	Weight.
									lbs. ozs.			lbs. ozs.
Brownell's Best	June 21	Strong	Early	Large	185	370	6	9	1·12	9	6	4·10
Early Puritan	do 21	do	do	Medium	207	414	8	5	1·10	14	0	5·02
Delaware	do 21	V. strong	Late	Large	246	492	7	2	1·05	11	4	4·01
Brownell's Beauty	do 27	Strong	do	Medium	183	366	9	6	1·09	12	2	3·02
May Queen	do 21	do	Early	do	208	416	12	13	2·08	13	8	4·02
Goodrich	do 24	do	V. late	Large	197	394	2	18	1·02	10	2	3·12
Bliss' Triumph	do 27	Medium	Early	Medium	140	280	8	27	2·10	12	3	2·12
Lee's Favourite	do 21	Strong	do	do	192	384	8	8	1·14	14	7	5·04
Marigold	do 24	do	do	Large	203	406	9	9	1·14	17	5	4·10
Halton Seedling	do 27	V. strong	do	do	157	314	7	16	2·04	13	6	6·00
Prolific	do 27	Strong	Late	Small	190	380	6	17	1·09	10	12	3·04
Chicago Market	do 20	V. strong	do	Large	212	424	13	6	3·02	15	9	6·00
Telephone	do 27	Strong	do	Medium	155	310	8	17	1·10	26	10	6·08
Early Maine	do 24	do	Early	do	249	498	11	12	3·01	10	7	3·00
Member of Parliament	do 24	V. strong	Late	V. small	266	532	14	63	4·01	13	19	3·10
Manhattan	do 26	Strong	do	Large	184	368	5	13	2·06	9	10	3·01
Early Callao	do 27	do	do	Medium	179	358	9	15	2·00	13	9	3·08
Early Conqueror	do 27	do	do	Large	217	434	3	13	1·08	10	3	3·04

POTATOES planted 31st May; taken up 3rd October—*Concluded.*

Varieties.	Came up.	Growth.	Matured.	Size.	Weight (2 rows, 66 feet).	Bush. per Acre.	19th August.			16th September.		
							Market-able.	Small.	Weight.	Market-able.	Small.	Weight.
									Lbs. Ozs.			Lbs. Ozs.
White Elephant	June 27	Strong	Late	Large	209	418	6	13	2·00	12	4	3·14
Richter's Elegant	do 27	do	Early	Small	180	360	11	7	2·04	16	7	3·12
Early Bird	do 27	do	do	V. small	185	370	5	19	1·06	10	4	2·08
Early Summer	do 25	do	do	Large	247	494	17	16	3·03	10	4	3·08
Early Rose	do 25	do	do	do	192	384	12	16	3·14	24	9	7·12
Richter's Gem	do 25	do	Late	Small	206	412	6	32	2·12	13	37	4·04
Snowflake	do 27	do	do	Medium	182	364	0	24	1·06	17	9	3·14
Clarke's Triumph	do 27	do	do	Large	191	382	10	19	2·08	18	7	4·14
Beauty of Hebron	do 27	do	Early	do	178	356	17	6	3·12	21	5	6·02
White Star	do 27	V. strong	Late	Medium	185	370	6	15	1·12	15	6	3·08
Seedling No. 21	do 27	do	do	Small	142	284	5	16	1·06	9	3	2·00
do 98	do 27	do	do	do	97	194	0	16	0·08	7	1	1·08
do 15	do 27	do	do	do	160	320	12	26	2·14	15	8	4·08
do 9	do 27	do	do	Medium	136	272	0	18	0·12	11	3	2·03
Lee's Ex. Early	do 15	V. strong	Early	Large	213	426	12	11	2·09	15	5	4·08
Empress Bell	do 27	do	Late	do	165	330	9	16	2·15	14	0	5·02
Late Rose	do 24	do	do	do	207	414	16	5	3·04	21	5	5·10
London	do 24	do	Early	do	171	342	14	7	2·12	8	2	4·08
Rural New Yorker	do 26	Strong	Late	Medium	158	316	15	17	2 12	9	7	3·08
Vermont	do 24	V. strong	Early	Large	172	344	4	11	2·12	14	8	4·06
Wonder of the World	do 26	do	do	do	203	406	12	13	2·12	18	1	5·10
Lizzie's Pride	do 21	Strong	Late	do	182	364	12	6	3·04	10	3	4·08
Early Eating	do 24	do	Early	Medium	157	314	6	15	2·06	20	10	6·14
Sharpe's Seedling	do 24	V. strong	do	Large	157	314	15	16	3·12	14	6	3·12
Rural Blush	do 24	do	Late	Medium	147	294	0	7	0·08	9	0	3·04
Clarke's No. 1	do 24	do	do	do	158	316	14	12	3·14	11	4	5·08
Assiniboia	do 21	do	do	Large	208	406	7	4	1·12	13	5	5·00
Sugar	do 28	do	do	Medium	137	274	0	17	0·09	10	8	2·12
Ohio Gunner	do 27	Strong	Early	do	132	764	14	10	3·05	10	7	3·00
Count Moltke	do 25	V. strong	Late	Large	218	436	16	15	3·08	19	6	4·14
Brownell's Winner	do 25	do	do	do	225	450	10	14	2·04	13	14	5·12
St. Patrick	do 27	do	do	V. small	243	486	4	71	3·08	16	29	4·08
Crown Jewel	do 25	do	Early	Large	253	506	12	14	2·08	17	11	5·14
Stonewall Beauty	do 25	Strong	do	do	182	364	12	13	3·06	9	6	2·10
Empire State	do 24	V. strong	Late	do	217	434	13	17	3·14	16	3	5·04
Jumbo	do 24	do	do	do	180	360	9	8	2·06	13	1	4·08
Early Ohio	do 27	Medium	Early	do	192	384	11	11	4·04	15	12	5·04
Thorburn	do 27	Strong	Late	Small	135	270	3	20	1·10	21	12	4·02
Vanguard	do 27	do	Early	Medium	170	340	12	21	4·01	16	14	4·08
Algoma No. 1	do 27	do	do	do	151	302	7	10	2·04	11	16	3·08
Seedling No. 2	do 25	V. strong	Late	Large	200	400	8	12	1·14	20	11	7·03
do No. 141	do 27	do	do	V. small	170	340	3	13	0·10	20	17	3·14
do No. 18	do 27	do	do	do	120	240	0	25	0·08	14	26	4·00
do No. 20	do 27	do	do	do	140	280	2	8	0·10	12	5	2·14
do No. 10	do 30	do	do	Medium	120	240	0	3	0·04	2	8	0·14
do No. 80	do 25	do	do	Large	225	450	7	10	1·12	13	3	5·08
Rose's New Giant	do 25	Strong	do	do	186	372	11	10	2·09	15	2	5·08

Tests were made by planting sets with one eye, two eyes and whole potatoes. Two good varieties were chosen for this test and the result was as follows :—

Varieties.	Planted.	Came up.	Taken up.			
Assiniboia 1 eye.....	May 21..	June 27..	Oct. 4..	11 hills when taken up weighed		40 lbs.
do 2 eyes.....	do 21..	do 27..	do 4..	do	do	30 do
do whole.....	do 21..	do 27..	do 4..	do	do	48 do
Empress Bell 1 eye.....	do 21..	do 28..	do 4..	do	do	34 do
do 2 eyes	do 21..	do 28..	do 4..	do	do	30 do
do whole..	do 21..	do 28..	do 4..	do	do	40 do

Vegetable Garden.

The testing of Garden Vegetables was continued this season, no attempt being made to grow very large specimens of any variety. The object being more to find out such early sorts as will mature each year in the North-west.

Beets.

Four varieties, Early Blood Red, Eclipse Dark Red, Black Night and Lentz were sown in garden on 7th May but were all considerably hurt by winds. Early Blood Red came out best. Eclipse, Lentz and Blood Red were again sown on 4th June. Eclipse and Lentz were a good crop ; the former giving at the rate of 496 bushels per acre and the latter 554 bushels. Blood Red was very poor and was not weighed.

Cabbage.

Eleven varieties were tested with following results :—

Varieties.	Sown in Hotbed.	Transplanted in Hotbed.	Transplanted in Ground.	Fit for use.	Pulled.	Remarks.
Autumn King.....	March 2..	Mar. 26..	June 1..	Oct. 1..	Oct. 24.	Large but late.
Succession.....	do 2..	do 26..	do 1..	Sept. 10..	do .	Fine large heads.
Vandergraw.....	do 2..	do 24..	do 1..	do 10..	do .	do do
Ex. Early Express....	do 2..	do 22..	May 28..	Aug. 4..	do .	Very good. Early. Heads small.
American Savoy.....	do 2..	do 22..	June 1..	Oct. 1..	do	Very late. Fair heads. Soft.
Henderson's Early Summer.....	do 2..	do 22..	do 1..	Sept. 2..	do .	The best 2nd Ey. Cabbage.
Large Drumhead	do 5..	do 22..	do 1..	do 20..	do .	Fair. Number of heads soft.
Ex. Early Etampes...	do 5..	April 3..	do 1..	Aug. 4..	do .	Good. Early but small.
Express Early.....	do 5..	do 3..	do 1..	do 6 .	do .	do do
Flat Dutch..	do 5..	do 3..	do 1..	do 6..	do .	Fair—did not head out well.
Ottawa	do 5..	do 3..	do 1..	Sept. 20..	do .	do —Our own seed mixed.

Celery.

The following varieties were sown in hotbed :—White Plume, Giant Pascal, Paris Golden Yellow, Dicks Many Hearted and Giant White Solid, but the seed of all except White Plume was so badly mixed that it was the only one transplanted.

This being the second year of testing the White Plume, it may safely be recommended as an early and good kind for the North-west.

Cauliflowers.

Five sorts were tested, but night frosts shortly after they were planted, checked the earliest varieties and only a small percentage formed heads. The late fall favoured the late kinds. The Autumn Giant produced the best heads of the 5 varieties.

Varieties.	Sown in Hot-bed.	Transplanted in Hot-bed.	Transplanted in Ground.	Fit for use.	Per cent of good Heads.	Remarks.
White Pearl	Mar. 2..	April 22..	May 5..	June 22..	20	Fair ; early ; frost checked growth.
Ex. Early Whitehead	do 2..	do 22..	do 5..	do 20..	80	Good ; fine heads.
Early Dwarf Erfurt	do 2..	do 22..	do 5..	do 15..	30	Fair ; came in too soon.
Early Snowball	do 2..	do 22..	do 5..	do 15..	30	do do
Autumn Giant	do 2..	do 22..	do 5..	Oct. 1..	75	Very late, but good heads formed. Roots of this variety taken up and placed in roothouse on 21st Oct., and good heads found up to 15th Dec.

Beans.

Twenty-four varieties were planted on 27th May, in hills 2 feet apart, rows 33 inches apart. Out of the 24 varieties only 3 matured before frost came on 12th September. Eight sorts were good for green-beans. Following is the list in full—

BEANS.

Varieties.	Sown.	Came Up.	Fit for Use.	Remarks.
Early Mazagan	May 27..	June 15..	Sept. 1..	All cut off with cut-worm. Started again, came on well ; late.
Royal Dwarf Kidney	do 27..	do 20..	do 8..	Did not mature ; frozen.
Long Yellow Six Weeks	do 27..	do 15..	.....	Pulled Sept., 12. One of the earliest and best.
Improved Refugee	do 27..	do 20..	.....	Did not mature.
Red Speckled	do 27..	do 20..	Aug. 8..	do
Dwarf Early Mohawk	do 27..	do 20..	do 20..	Very good green.
Yosemite Valley	do 27..	July 1..	do 20..	Strong growth with few pods.
New Cylinder Wax	do 27..	June 20..	do 24..	One of the best late varieties.
Crystal White Wax	do 27..	do 24..	do 26..	Very good but late.
Golden Wax	do 27..	do 20..	do 16..	Good.
Dwarf German Black Wax	do 30..	.....	.....	None came up.
Dwarf German White Wax	do 30..	do 20..	do 10..	Large crop of short thick pods.
Mam. Red German Wax	do 30..	do 22..	do 20..	Extra heavy crop of large tender pods.
Yellow Six Weeks	do 30..	do 20..	do 8..	Green beans good. Ripe September 9.
Canadian Wonder	do 30..	do 20..	do 20..	Green beans fair.
Cranberry Pole	do 30..	do 24..	.....	Late ; did not pod.
Black Wax Pole	do 30..	do 24..	.....	do
Early Golden Cluster	do 30..	do 24..	.....	do
Andalusian Pole	do 30..	do 24..	.....	do
Giant Red Wax	do 30..	do 24..	.....	do
Henderson's Bush Lima	do 30..	do 24..	.....	Late.
Broad Windsor	do 30..	do 24..	Aug. 8..	Did well.
Early Dun Coloured	do 27..	do 20..	do 8..	One of the best green beans. Ripe Sept. 9.
Flageolet Wax	do 27..	do 20..	do 20..	Very good.

Carrots.

Four sorts were tried. All did well. Sown in drills 13 inches apart.

Varieties.	Sown.	Came up.	Fit for use.	Yield per acre.
				Bush. Lbs
Early Scarlet Short-horn	May 7..	June 6..	Aug. 10..	217 48
Guerande or Ox-heart	do 7	do 6 .	do 20	390·13
Peer of all	do 7	do 6..	do 20	508·12
Forcing Gem	do 7	do 6..	do 12	299·28

Cucumbers.

Three varieties were tested and all bore a good crop of cucumbers.

Varieties.	Sown.	Bearing.
Early Cluster	April 2..	July 8..
Giant Pera	do 2..	do 12..
Early Short Green	do 2..	do 8..

Citrons.

Citrons were sown in frame and in open ground on 5th July and fruit ripened from both on 15th Sept.

Corn.

Two sorts of corn were planted, Mitchell's Extra Early and Early Cory. Mitchell's Extra Early had green corn fit to use on 10th Sept. The Early Cory was later by six days and was cut down by frost on 12th Sept.

Lettuce.

Toronto Gem and Rosedale were sown on 7th May but were cut down by wire worms. Boston Market was sown on 2nd July, was fit to use on 10th Aug., and is highly recommended. Toronto Gem and Rosedale were again sown on 14th July, were fit to use 10th Aug., and continued in use untill the ground froze up early in November.

Onions.

Nine varieties of onions were sown in the hotbed and transplanted in the open. The same sorts were also sown in the open ground. Those sown in the open were almost entirely killed by wire worms. Those transplanted were set out in rows 20 inches apart and 4 inches in the row. Dates of sowing, transplanting, when fit for use, and yield are given below.

Variety.	Sown in hot-bed.	Transplanted in open.	Fit for use.	Yield per acre.	Remarks.
				Bus. Lbs.	
Giant Roca	April 2...	May 31..	Aug. 10..	399 18	Fair size.
Small Silverskin	do 2...	June 15..	do 1..	.....	Very small.
Prize Taker	do 2...	do 15..	do 15..	508 12	Good.
Large Red Wethersfield	do 2...	do 15..	do 15..	236 00	Some good. Number of thick neck.
Mammoth Silverskin	do 2...	do 15..	do 20..	254 6	Fair.
Yellow Globe Danvers	do 2...	do 15..	do 15..	471 54	Very good.
Spanish King	do 2...	do 15..	do 20..	598 57	Fair size.
White Barletta	do 2...	do 15..	do 1..	.....	Very good.
Red Globe	do 2...	do 15..	do 15..	399 18	do

Parsley.

Triple or Curled, sown 7th May, fit to use 15th August. Good.

Parsnips.

Long Smooth and Hollow Crown sown. Came up 11th June. None were fit to use on account of being eaten by wire worms.

Pepper.

Two varieties were sown, viz.: Spanish and Propopp's Giant, but neither grew.

Sage.

Holt's Mammoth, sown in hot-bed and transplanted. Did well.

Radish.

Olive Shaped and China Pound sown in ground 7th May. Came up well but were killed by worms. Were sown again on 14th June, Olive Shaped producing a good crop; China Pound again killed.

Tomatoes.

Eleven varieties were sown in hot-bed, but only four grew. Following is the test in full :—

Varieties.	Sown in hot-bed.	Transplanted in ground.	Formed fruit.	Ripe.	Remarks.
Early Ruby	April 2	June 22	July 4	Aug. 15	A fair crop.
Halliway	do 2	do 22	do 4		Had a good crop but did not ripen.
Potato Leaf	do 2	do 22			Did not grow.
Earliest of All	do 2				do
Strawberry	do 2				do
Matchless	do 2	June 22			Formed fruit but did not ripen.
Dwarf Champion	do 2				Did not grow.
General Grant	do 2				do
Canada Victor	do 2				do
Conqueror	do 2				do
Acme	do 2				do

Asparagus.

Bed planted in 1889 was in full bearing this year, but on account of late spring the first cutting did not come in until June. The last cutting, however, extended into August. New bed put out 1891, gave first cutting earlier than old bed, but asparagus was not so large. A large number of roots of this vegetable have been distributed from the farm each spring to many farmers in different parts of the Territories.

Rhubarb.

Four varieties are grown. Stotts, a very large sort, grows stalks three inches in diameter. Victoria, Myatt's Linnaeus and Carleton Club are all good, except the latter which is rather rank, The two former are recommended on account of their excellent flavour.

FLOWER GARDEN.

The following flowers were grown the past year and gave very pleasing results. All or any of the sorts may be recommended for the North-West.

Annuals.

Mignonette, Aurea, extra good.
do Matchet, very good.
do Common, good.
Dianthus, Heddiwidgii, very good.
do Diadem Pink, very good.
do Chinensis, very fine.
do Lanceatus, very fine.
Phlox Drummondi, very good.
Godetia, Lady Satin Rose, extra good.
Asters, very fine.
Stocks, Dwarf German, very fine.
do Dwarf Bouquet, very fine.
do Dwarf Large flowering, very fine.
Petunias, single and double, very good.
Verbenas, not very good.
Sweet Alyssum, good.
Zinnia, Grandiflora, very good.
Zinnia, Haagenia, very pretty.
Pyrethrum, Golden Feather, fine border.
Pansies, fair flowers.
Portulacca, very fine.
Chrysanthemum, annual, extra fine—good show.
Salpiglossis, very good.
Flowering Flax, a very fine plant for border.
Columbine, very good.
Delphinium, very fine
Lilies, Tulips, Peonies and Iris were fair and made a good show.

FRUIT TREES.

Apple Trees.

Five hundred seedling Russian apple trees planted in the spring of 1890, having stood the winter of 1890 and 1891, without the loss of a single tree, it was expected that the majority, at least, would survive the second winter. I am, however, sorry to report that every tree was dead this spring.

One tree of Red Siberian Crab planted in 1888, alone survives of all the apple and crab trees planted in that year. This tree had a few blossoms the past spring, but they were unfortunately blown off before the fruit set. In the spring of 1891 42 varieties of named Russian apples were planted. All were living in the fall, but were dead this spring.

Three varieties of Russian Dwarf apple tree set out in 1889 are still in existence, but kill back each winter and make very little growth in the summer.

The past spring seven kinds of apple trees—Red Raspberry, Little Hat, Sugar Sweet, Hare Pipka, Blushed Calville, Bodi and Saccharine were planted in a sheltered plot; also three varieties of cherries, viz. : Vladimir, Bessarabian and Titovka.

Currants.

All the varietie of currants bushes produced a full and fine crop of fruit. Raby Castle gave the largest crop among the Red varieties and Black Naples in the black sorts. The earliest fruit was from the Red Dutch and Lee's Prolific (Black) and the largest and finest currants grew on the Fay's Prolific (Red).

The native black currants gave an immense crop of large fruit but were two weeks later in maturing than the cultivated varieties and ripened more unevenly.

Raspberries.

The raspberry bushes the past season did extremely well, more especially the Turner, which gave a large crop of fine berries. The first fruit was ripe on 1st August and the bushes continued bearing up to 1st October. After three years trial this variety is highly recommended for growing in the North-West. The Philadelphia also gave a large crop, but the berries were not so good in flavour as the Turner. Hornet and Dr. Reeder did well, producing a large crop of fine fruit.

Cuthbert, Golden Queen and Caroline were killed back considerably but where protected, all bore fine fruit.

Native Raspberry bushes planted in 1889, produced a fair crop of berries but their flavour was poor in comparison with the cultivated sorts.

Gooseberries.

Were all badly winter killed and bore little or no fruit, Smith's Improved and Houghton each had a few berries.

Strawberries.

New Dominion and Capt. Jack gave a fair crop of poor berries, only one out of ten being perfect. All the vines came through the winter safely and blossomed plentifully, but dry hot winds shortly before the berries matured ruined the crop.

Preparations for Wintering.

The Raspberry canes were all laid down before winter set in, and covered with two inches of earth and over this a coating of rotted manure to keep the earth from blowing off. This covering is left on as long as possible in the spring to retard the early growth.

Strawberry vines are covered with coarse manure after the ground freezes up. Rhubarb and asparagus have a thick coating of manure put over them each fall, which is dug under in the spring.

FOREST TREES.

The majority of the elm trees received from Nebraska, U.S.A., in 1890, were, last winter, again killed back but this summer have made a good growth. The ash—white and green—also received from Nebraska are almost entirely gone, a few barely existing. All others are dead. Norway spruce planted in 1888, which have just existed from that time, the past season under the friendly protection of a hedge of Manitoba maple, made the best ; in fact, the only growth they have made since they were planted.

Very few foreign trees have been set out this season and until the hedges and wind-breaks grow, which have been planted, sufficiently thick to afford protection, there appears to be very little use in making further tests, in this line.

Last spring 10,500 native maples, ash and elms were transplanted into hedges, wind-breaks and other plots on the farm. The trees were 2 and 3 years old and were taken from nurseries on the farm.

Wind-breaks and other plantations of trees, consisting of native varieties, did extra well the past season and promise well for the coming year on account of this summer's growth being well ripened and hardened. The wind-breaks set out for the protection of vegetables, fruit trees, valuable varieties of grain, grasses, &c., made excellent progress, and additions of willow, poplar and artemisia were made to them. I had pleasure in referring, in my last report, to the success of Artemisia abrotans as a hedge plant. This year I have to report its continued success for that purpose. Already this winter, snow banks three or four feet deep, caused by its close and thick growth, cover the fruit trees. As fast as possible, hedges of this shrub will be set out over the whole grounds, and in a few years better success will, without a doubt, attend the growing of fruit and other trees. Next to Artemisia, ranks the native maple as a windbreak. One or two rows sown thickly, will in three years afford considerable shelter to the more

tender trees. Hedges of this tree will also be set out as speedily as possible along roads and other exposed portions of the farm.

Among the shrubs Caragana arborescens, Syringa alba (Lilac), Spirea opulifolia and Ribes aureum (Fowering currant), continue to hold their place well. Caragana is first in hardiness over anything in the tree or shrub line including all the native sorts.

Willows and Poplars.

The Russian Willows, Salix Voronesh and Salix acutifolia and Poplars, Riga Wobstii and aurea again did very well.

CATTLE.

I have pleasure in reporting the stock on the farm to be in good health and condition. At present the pure bred animals consist of Durham, Polled Angus and Holstein, numbering in all 23 head.

The Ayrshires were all shipped to the Experimental Farm at Agassiz, British Columbia, early in the fall, for the reason of there being little or no demand for them here.

A young shorthorn bull—Red Knight, 16,675—has been received from the Central Experimental Farm, purchased from Mr. John T. Hobson, Mosborough, Ont., to take the place of Rosy Prince 8th, whose calves will be coming in next spring. Three Polled Angus females have also been received from the Experimental Farm at Ottawa.

Rations Fed to Stock.

At present the following rations are being fed to stock. Cut feed being green oats cut with Binder and cut up with straw-cutter.

To Cows in Calf.

Morning—9 lbs. cut feed, 2 lbs. mixed meal.
Noon—Wheat straw, 1½ lbs. do
Evening—8 lbs. dry cut feed, 5 lbs. turnips.

To Milking Cows.

Morning—9 lbs. damp cut feed, 2 ½lbs. meal, 2 lbs. bran.
Noon—Wheat chaff, 1 lb. meal, 1 lb. bran.
Evening—9 lbs. dry cut feed, 7 lbs. turnips, 2 lbs. meal.

To Young Stock.

Morning—4¼ lbs. damp cut feed, 1½ lbs. meal, 1 lb. bran.
Noon—Wheat chaff, 1 lb. meal, ½ lb. bran.
Evening—5 lbs. dry cut feed, 3 lbs. turnips.

To Bulls.

Morning—9 lbs. damp cut feed, 2½ lbs. meal.
Noon—Wheat chaff and straw.
Evening—8½ lbs. dry cut feed, 6 lbs turnips.

Milking Test of Holstein Cow "Abi."

The results obtained from the milking of this cow, now five years old, are, I think, so good as to deserve being placed on record.

Calved 20th December, 1892.

Test 23rd December, to 22nd January, inclusive, 31 days. Average yield per day, $72\frac{18}{31}$ lbs. or $29\frac{11}{31}$ quarts. Total, 900 quarts or 225 gallons—equal to 2,250 lbs. Dur-

ing the period of this test the cow was milked three times daily—at 7 a.m., 4·20 p.m., and 9 p.m.

Daily Ration.	Quantity.	Total.
	Lbs.	Lbs.
Hay	15	465
Cut oat sheaves	15	465
Turnips	15	465
Ground barley and oats	15	465
Oil cake	4	124
	64	1,984

MILKING TEST, "ABI."

Date.	Morning Milking.	Afternoon Milking.	Night Milking.	Total.	Date.	Morning Milking.	Afternoon Milking.	Night Milking.	Total.
	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.	Lbs.	Lbs.	Lbs.
Dec. 23..	25	20	16	61	Jan. 8...	27½	28	17	72½
do 24..	30½	28	12½	71	do 9...	28	30	18	76
do 25..	30	29	13	72	do 10...	31	27¼	18¾	77
do 26..	31	26	12	69	do 11...	27½	30¼	15	72¾
do 27..	31½	30½	13½	75½	do 12...	30¼	29	17½	76¾
do 28..	24½	27½	12½	64½	do 13...	27½	31	14	72½
do 29..	30	29	14	73	do 14...	29	29½	14½	73
do 30..	30	30¼	14¾	75	do 15...	30½	28	15	73½
do 31..	32	31	16	79	do 16...	30½	28	18	76½
Jan. 1..	29	31¼	17½	77¾	do 17...	27½	27	15½	70
do 2..	33	28	16	77	do 18...	25	24	15	64
do 3..	30	29½	15½	75	do 19...	25½	27	17¼	69¾
do 4..	32	28	14¼	74¼	do 20...	25	24	13	62
do 5..	30¾	30¼	16¾	77¾	do 21...	27½	28	15½	71
do 6..	30¾	29	14	73¾	do 22...	28¼	23¼	16¾	68¼
do 7..	30	33	16	79					
						900½	874½	475	2,250

Young Stock.

Following are weights of young stock on 2nd December, 1892; the date of birth being given:—

Stock.	Date of Birth.	Lbs.
Durhams, pure heifer	June 20, 1891	940
do do	March 26, 1892	530
do grade steer	January 20, 1891	1,155
do grade heifer	do 14, 1891	1,045
do do	February — 1891	1,090
do do	January 20, 1891	885
do grade steer	do 14, 1892	810
do grade heifer	May 5, 1892	500
Polled Angus, pure heifer	October 9, 1891	876
do do	December 6, 1891	730
do do	September 14, 1892	300
do grade steer	January 20, 1892	760
Holsteins, pure heifer	February 10, 1891	965
do do	December 28, 1891	700
do do	September 13, 1892	302
do grade heifer	February 10, 1892	635
do do	April 18, 1892	600

Swine.

During the fall two breeds of pigs were obtained from the Central Experimental Farm, Ottawa, Berkshire and Improved Large Yorkshire, which will form the beginning of these breeds on the farm here.

Experiments in Feeding Frozen Wheat to Swine.

These experiments were made to determine the value of frozen wheat made into pork.

Two large sows, the only pigs available, were shut up on 22nd August, in an open pen, after being weighed, and fed for two months on frozen wheat soaked in water for 24 hours before being fed. The wheat was fed whole.

The pigs were weighed on 22nd October and found to have gained 172 lbs. The weights being 22nd August, 900 lbs., and 22nd October, 1,072 lbs.

The price of pork at Indian Head, on 22nd October, was 7 cents per lb. The value of gain in weight would therefore be $\$12\frac{04}{100}$.

Nine hundred and sixty lbs., or 16 bushels of wheat were fed in the two months; therefore, the value of frozen wheat in pork would in this western country, on the basis of this experiment, be about 75 cents per bushel.

On 22nd October, the feed was changed, and ground instead of whole wheat was fed. The wheat being wet at times of feeding. On 2nd December the pigs were weighed and found to have gained 50 lbs., having eaten 510 lbs. of ground wheat; making price of pork $\$3\frac{50}{100}$ and value of grain $41\frac{1}{4}$ cents per bushel.

The difference in gain in pork for amount of wheat eaten may be accounted for partly by the cold weather, and partly by the age and weight of the animals.

In above experiments the animals were not in a comfortable house, but exposed to the weather, as the majority of North-west pigs are when fattening, and the experiment may show farmers what may be gained by feeding frozen wheat instead of selling it.

Poultry.

I cannot report much success in raising fowls the past year. Commencing very early in the season to eat their eggs, it was some time before enough could be obtained to set hens, or sell to applicants. Ten hens were set from first to last of season bringing out twenty-three pullets and twelve cockerels. From reports received from those to whom eggs were sold, no better success has followed them. No doubt too close confinement for the fowls has been the cause.

Distribution of Grain, Potatoes and Trees.

During the spring 17,770 Seedling Maple, Ash and Elm trees were distributed by mail to applicants throughout the Territories. In addition to forest trees, a distribution of small fruits, chiefly Raspberry and Currant bushes, Cuttings, and Strawberry vines, Asparagus roots, Rhubarb, etc., was made. The larger part of the forest trees were sent in packages of 100 each, and judging from the reports to hand, about 60 per cent of the trees have lived.

This fall 250 dozen Raspberry plants were taken up and healed in for distribution next spring.

Considering the amount of trouble and uncertainty of raising a fair percentage of young trees so sent out, a large quantity of tree seeds were, under your instructions, gathered the past fall for distribution this next spring. As there are a great number of seeds in the small bag intended to be sent to each applicant, and very little trouble in raising trees from the seed, it is confidently hoped and expected that this will prove a successful method to induce farmers and others to go in for tree growing.

It has proved the best, in fact, the only way on the experimental farm to grow trees on our plains, and if the North-west settler will give the seed sent out, a little attention for the first few years, nothing in his tree-growing experience in this country will give him better satisfaction.

Distribution of Grain.

Before seeding commenced 417 three-pound bags of grain, were distributed to settlers in the Territories. The lot consisted of wheat, oats, barley, pease and rye, and these were sent to all parts of the North-west.

Distribution of Potatoes.

Two hundred and nineteen three-pound bags of potatoes, consisting of those sorts which gave the best yield in previous year, were sent to applicants throughout the Territories.

Improvements.

During the past summer an implement house, 28 x 75 feet, has been erected. Besides holding the farm implements and machinery, there is a room for light vehicles; an exhibition room, in which samples of grain in straw and threshed, grasses, &c., grown on the farm, are shown; and a room for cleaning, sorting and storing grain, which is indispensable this year on account of the large quantity of samples being prepared for the Chicago Exposition, of our own and other North-west products.

Ensilage.

As intimated in my last report, 43 tons of ensilage was put in the silo in summer of 1891. Mixed grain, sown for the purpose, was cut green and put in the silo in the following order:—Rye, wheat and oats; rye and oats; wheat; barley and oats; Millets and Hungarian grass; rape; corn. The corn, not being well matured, was not preserved in good condition. Rape was found to be useless and was not eaten by the stock. The millets and Hungarian grass were not very good, but were eaten. Barley and oats came out in good order and the mixture of rye and oats was also good. Wheat, rye and oats was poor, the wheat especially poor and was not eaten. This was no doubt caused by the wheat being coarse and not packing closely. Shortly after commencing to use the ensilage, the thermometer dropped to 40° below zero and the top of the ensilage froze about an inch during the night and continued freezing more or less during the severe weather, but by taking the ensilage out of the silo into the basement an hour or two before using, the frost would go out and leave it in perfect condition.

This year the silo has been filled with mixtures of oats and barley; rye, barley and oats; and oats and corn. All were cut into short lengths by the cutting-box before being put in the silo and the whole covered with two feet of cut straw.

At this date, 10th December, oats and corn are found to be in good condition.

Injurious Weeds.

Two very bad weeds have made their appearance in this vicinity and on the Experimental Farm, and from reports one if not both are to be found in other parts of the Territories. One is called "Tumble Weed," from its habit after ripening its seed of breaking off above ground and tumbling over the country, with every wind, scattering its seed in all directions. This weed belongs to the mustard family and is very like mustard except the flower which is not so large or yellow.

One stalk has been found with 500,000 seeds and any fairly well developed plant contains 75,000 seeds. This weed has been growing in this district for several years but no notice has been taken of it. Last year it made such headway and caused so much loss in fields of grain, that steps should be taken at once to stop its further progress or the whole country will soon be over-run with it. The plants found on the Experimental Farm were from seed dropped last year, and in several places they were very thick. No trouble is found in killing the weed either by ploughing, harrowing or pulling up. Cutting it above ground only adds to the number of seeds in the end. Samples of this weed have been sent to Mr. James Fletcher, Botanist of the Experimental Farm, Ottawa, who will no doubt report more fully on it.

Another and perhaps better known weed than the above is French or stink weed, which is causing so much trouble in the Red River settlements. It was also found on

the Experimental Farm last year and has obtained a foothold in other sections of this country. This weed, unlike the Tumble weed, drops its seed where grown and eventually covers the entire land, killing all other growth. Both weeds were shown last fall at a Dairy Meeting in Regina, held during the Regina fair, and to Members of the Legislative Assembly, who were advised of the dangerous habits of these weeds. It is hoped steps will be taken while these weeds are confined to small sections of the country to entirely eradicate them.

No mention is made of other weeds such as Pig weed, Wild Buckwheat, &c., which every settler has according to his mode of farming, but I wish to draw special attention to the new comers on account of their dangerous habits and recent arrival amongst us.

Smudges.

Last year exception was taken to the results of a smudge test made on the Experimental Farm, for the reasons, 1st, That the smudges were not started soon enough before the freezing point was reached, and 2nd, on account of the low point to which the thermometer fell on that occasion.

This year to test these points more thoroughly, material was placed around a one-tenth acre plot of wheat, to be ready for the first frost, which did not come, however, till the night of the 12th and 13th of September. All wheat having been cut prior to this date the smudge material was moved to a one-tenth acre of late sown oats.

Early in the evening the smudge was prepared and lighted at 10.45 o'clock, when the thermometer indicated 36°, or 4° above freezing. The wind being from the south, two instruments were placed 100 feet south of the smudges. One was placed 3 feet 9 inches above the ground; the other one foot above. Two other thermometers were put in the grain; one even with heads of grain 3 feet 9 inches above ground, and the other one foot from the earth. A thick heavy cloud of smoke continually passed through and over one-half of the plot on which the instruments were, and the other half was left to see difference between smoked and non-smoked portions. During the first hour after the smudges were started the temperature fell 3°, all the thermometers recording 33°. At 12 o'clock the two instruments away from the smoke, and the one in the grain even with the heads, registered 32°, or freezing; while the one in the grain, one foot from the ground recorded 31°, or 1° of frost. At 12.15 o'clock all the instruments were up 1°, making the three to indicate 33° and the one 32°. At 12.30 the downward course was again taken and at 1 o'clock the three thermometers recorded $1\frac{1}{2}$° frost and the other one $2\frac{1}{2}$°. The lowest point reached was at 1.20 o'clock when the three thermometers registered 29° or 3° of frost and the one 28° or 4° frost.

The three thermometers that continually kept together are three of the four used last year and were inspected one month before the test by an officer from the Meteorological office, Toronto, and pronounced perfectly accurate.

The instrument placed 1 foot above ground in the grain was an ordinary thermometer bought at a store for 50 cents and probably was not perfectly accurate when the temperature fell below freezing.

No injury was done to the grain and between the smoked and unsmoked portions, no difference could ever be observed; showing that 3° of frost will not injure oats, at least, whatever it may take to hurt wheat.

The three correct thermometers falling together, one of them always in the smoke, indicates that smoke has no effect on the temperature, whatever effect it may have on the grain, and it is reasonable to conclude that if smoke has no effect on the temperature, grain will certainly suffer when a low enough point is reached.

Samples of Grain, Grasses, &c., Prepared for Chicago Exposition.

Under your instructions, a number of samples of grain in the straw of each variety grown on the farm have been prepared for the Chicago Exposition, also samples of threshed grain of all varieties.

Early in November a collection of roots and vegetables grown on the Experimental Farm and throughout the Territories, was shipped to Chicago.

A collection of native grasses, numbering 63 varieties, all named, and gathered principally on the farm, and 17 cultivated varieties grown on the farm has been prepared for the same purpose.

Under directions of the North-west Government, collections of grain in the straw, samples of threshed grain, collections of native grasses, &c., have been or are now being made by the agricultural societies, towns and private individuals, and forwarded to the Experimental Farm, where they are being sorted and repacked, and early in the new year will be shipped to the Chicago Exposition, and there shown.

In addition to the above, ten boxes of samples of wheat, barley, oats and peas in straw and threshed have been prepared for the Department of the Interior and shipped to Winnipeg for immigration purposes.

These collections have entailed on our small staff a large amount of extra work thereby causing our regular work to be somewhat interfered with.

Stallion.

In April the Clyde stallion James Arthur, 1734 (5688) from the Haras National of Montreal, arrived on the farm. Forty-three mares were served during the season.

Meteorological.

Temperature, rainfall and sunshine, maximum and minimum for twelve months; rainfall for the growing season; sunshine for the growing season.

Temperature.

Months.	Maximum.	Minimum.
January	40° on 23rd	—44° on 18th
February	32° on 22nd and 23rd	—35° on 15th
March	51° on 30th	—27° on 15th
April	64° on 22nd	7° on 8th
May	85° on 22nd	5° on 1st
June	83° on 18th	33° on 13th
July	96° on 6th	36° on 25th
August	98·5° on 1st	40° on 9th and 22nd
September	87° on 28th	25° on 30th
October	81° on 5th	15° on 29th
November	45° on 4th	—13° on 21st and 22nd
December	19° on 8th	—15° on 2nd

Rainfall.

	Inches.
April	.6
May	.82
June	2·59
July	1·09
August	·89
September	·93
Total	6·92

Sunshine.

	Hours.
March	121·1
April	129·5
May	173·9
June	214·2
July	309·2
August	232·4
September	166·1
Total	1,346·5

Exhibitions Attended.

On account of the large amount of work and material required for the Chicago Exposition, only one exhibition in the Territories, away from home, was attended the past fall at which products of the farm were shown.

The annual exhibition at Regina being considered very important, as large a collection of grains and grasses as could be prepared was shown there. It was intended to show at Grenfell and Wolseley, but time would not permit. These will be reached next year if possible.

I have the honour to remain,

Your obedient servant,

ANGUS MACKAY.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 31st December, 1892.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report for 1892, being the fourth annual report of the work done on the Experimental Farm at Agassiz.

The weather during January, February and March was mild and wet. The lowest reading of the thermometor was on January 10th, when it showed 7 above zero, but it continued cool and wet through April and until towards the last of May, and the spring growth was slow and backward in consequence. During the last week in March and the first two weeks in April we had slight frosts which had a very damaging effect on the fruit blossoms, destroying the peach, apricot and nectarine, as well as a large portion of the plums. These frosts were not confined to this locality, but were very general along the coast as far south as the orange districts of California.

The season for grain, roots and hay has been a fairly good one, and these crops are a good average over the whole province, with fine weather for harvesting all grain that had been got into the ground in good season in spring. Those fields sown late, ripening during the latter part of September, were difficult to harvest, as September was a very rainy month.

The fall wheat suffered from the wet during winter and the long continued, cool, wet weather in spring, and as a result is a very poor crop, some of the varieties being nearly killed out.

No new land has been ploughed this year, but about twenty acres have been got ready: the large trees and stumps grubbed out and the brush cut.

The land seeded down is showing a good catch of grass, both clover and timothy. The tares sown last fall made an early start, and were ready to cut for feed early in May, having as early as May 5th made a growth of three feet.

I am glad to be able to report that throughout the province generally the crops of grain and roots have been good.

This has been in many places, an off year for fruit, most varieties being light in yield, but everywhere the area in fruit is being rapidly extended.

Hops, also, are receiving considerable attention, there being several yards of considerable extent in the Sumas and Chilliwack districts, three in this neighbourhood and several in the Okanagan Valley, from all of which come good reports. And there is a good prospect of hops being a profitable crop to raise, as the soil and climate appear to be well adapted for their production.

FALL WHEAT.

Twenty-three varieties of fall wheat were tested this year.

The climate does not appear to be suited to fall wheat, as the grain changes rapidly, and after one or two years becomes very soft, and the winters, although very mild, appear to be hard on the wheat plant. The varieties tested on the Experimental Farm suffered to a considerable extent, and the yields were very light.

The following table shows the yield per plot of $\frac{1}{20}$ of an acre, and the time from sowing to harvest. Seed used, 90 lbs. per acre.

Varieties.	Date of sowing.	Headed.	Harvested	Length of Straw.	No. of Days to ripen.	Yield of $\frac{1}{20}$ of an Acre.	Yield per Acre.
				Feet.		Lbs.	Bush. Lbs.
Carter's Hybrid A	Nov. 11..	June 18..	Aug. 6..	3 to 3½	268	28½	9 30
do B	do 11..	do 17..	do 4..	4 to 4½	266	40	13 20
do C	do 11..	do 20..	do 3..	3 to 3½	265	28	9 00
do D	do 11..	do 21..	do 3..	3½ to 4	265	22½	7 30
do F	do 11..	do 9..	July 28..	3½ to 4	259	14	4 40
do G	do 11..	do 23..	Aug. 5..	3 to 3½	267	11	3 40
do H	do 11..	do 20..	do 4..	3½ to 4	266	18	6 00
do J	do 11..	do 16..	do 4..	3½ to 4	266	26¾	8 55
do K	do 11..	do 15..	do 2..	4 to 4½	264	56	18 40
Democrat	do 10..	do 6..	do 8..	3 to 3½	266	26¾	8 55
Tasmania	do 10..	do 8..	do 5..	3 to 3½	268	23	7 40
Manchester	do 11..	do 7..	do 4..	3 to 3½	266	15	5 00
Velvet Chaff	do 10..	do 9..	July 29..	3½ to 4	261	19	6 20
Square Head	do 10..	do 17..	Aug. 10..	3	273	8½	2 50
Early Red Clawson	do 10..	do 2..	July 26..	4	258	29½	9 50
Golden Cross	do 10..	do 6..	do 27..	3 to 3½	259	18½	6 10
Royal Prize Red	do 10..	do 20..	Aug. 6..	3	269	17½	5 50
Fill Measure	do 10..	do 19..	do 5..	3 to 3½	268	22½	7 30
Volunteer	do 10..	do 5..	July 29..	3 to 3½	261	46	15 20
Carter's E	do 10..	do 22..	do 27..	3½ to 4	259	44	14 40
Amber (Martin's)	do 10..	do 14..	do 27..	3½ to 4	259	35	11 40
Golden Drop	do 10..	do 21..	Aug. 5..	2½ to 3	268	Killed out.	
White Queen	do 10..	do 18..	do 5..	3	268		Only a few headsripened.

EXPERIMENTS WITH SPRING WHEAT, BARLEY AND OATS.

Plots of one-twentieth of an acre of wheat, barley and oats, were sown on the same day, and on land that had been first ploughed in August of 1891. The soil was uniform in character, and similarly treated in each case.

Plots sown, Spring Wheat, at the rate of 90 lbs.—1½ bushels per acre.

Varieties.	Sown.	Up.	Headed.	Ripe.	Length of Straw.	Days to Ripen	Yield per Plot.	Yield per Acre.
							Lbs.	Bush. Lbs.
Ladoga	May 12.	May 19..	July 4..	Aug. 20..	2½ to 3 ft.	100	52	17 20
White Fife	do 12..	do 18..	do 4..	do 30..	3 to 3½ ft.	110	38	12 40
Russian Hard Tag	do 12..	do 19..	do 8..	do 26..	2½ to 3 ft.	106	41½	13 50
Rio Grande	do 12..	do 17..	do 6..	do 30..	3½ to 4 ft.	110	62	20 40
Judket	do 12..	do 18..	do 11..	do 29..	3 to 3½ ft.	109	52	17 20
Saxonka	do 12..	do 17..	do 7..	do 27..	2½ ft.	107	52	17 20
Pringle's Champlain	do 12..	do 17..	do 9..	do 27..	3 to 3½ ft.	107	58	19 20
Gehun	do 12.	do 17..	do 9..	do 29..	2½ to 3 ft.	109	35	11 40
White Russian	do 12 .	do 18..	do 7..	do 26..	3½ ft.	106	52½	17 30
White Delhi	do 12..	do 18..	do 11..	do 29..	3½ ft.	109	46	15 20
White Connell	do 12..	do 19..	do 12..	do 26..	3 to 3½ ft.	106	35½	11 50
Defiance	do 12..	do 19..	do 11..	do 29..	2 to 2½ ft.	109	35	11 40
Wellman's Fife	do 12..	do 19..	do 7..	do 28..	3¼ to 3½ ft.	108	45	15 00
Indian Hard Calcutta	do 12..	do 18..	do 6..	do 26..	2 ft.	106	29½	9 50
Colorado	do 12..	do 18..	do 7..	do 29..	3½ ft.	109	50	16 40
Red Fife	do 12..	do 18..	do 7..	do 30..	3¾ ft.	110	65½	21 50
Campbell's White Chaff	do 12..	do 17 .	do 14..	do 27..	3½ ft.	107	81½	27 10
Campbell's Triumph	do 12..	do 18..	do 16..	do 28..	3¼ ft.	108	72	24 00
Anglo-Canadian	do 12..	do 18..	do 19..	Sept. 2...	3½ ft.	113	49	16 20

It will be seen that Campbell's White Chaff, Triumph and Red Fife have been the heaviest yielders which corresponds closely with the experience of 1891.

Barley.

Plots sown at the rate of 96 pounds (2 bushels) per acre.

Varieties.	Sown.	Up.	Headed.	Ripe.	Length of Straw.	Number of days to Ripen.	Yield per Plot.	Yield per Acre.
					Ft.		Lbs.	Bush. Lbs.
Goldthorpe	May 12..	May 19..	July 16..	Aug. 25..	2½ to 3	105	67½	28 6
Golden Melon	do 12..	do 21..	do 16..	do 25..	2¾	105	52½	21 42
Saale	do 12..	do 18..	do 16..	do 25..	2½ to 3	105	67	27 44
Duck-bill	do 12..	do 21..	do 15..	do 25..	3	105	73½	30 30
Webb's Kinver	do 12..	do 21..	do 14..	do 24..	2½	104	56	23 16
Peerless White	do 12..	do 19..	do 16..	do 27..	2¼ to 2½	107	64½	26 42
Improved Chevalier	do 12..	do 20..	do 16..	do 26..	2 to 2½	106	67½	28 6
Danish Chevalier	do 12..	do 22..	do 14..	do 25..	2 to 2½	105	67	27 44
Rennie's Improved	do 12..	do 20..	do 7..	do 22..	2 to 2½	102	67	27 44
Odessa	do 12..	do 20..	do 7..	do 18..	2½ to 3	98	57	23 36
Oderbruch	do 12..	do 19..	do 5..	do 8..	2 to 2½	88	38½	13 46
Common Six Rowed	do 12..	do 20..	do 9..	do 25..	2	105	46½	19 18
Six Rowed Wheat, barley	do 12..	do 18..	do 9..	do 12..	2½	92	53	22 4
Mensury	do 12..	do 19..	do 6..	do 10..	3	90	68	28 16
Spiti Valley	do 12..	do 18..	do 4..	do 9..	1½	89	46	19 8
New Golden Grains	do 12..	do 18..	do 8..	do 26..	3	106	72¼	30 5

In 1891 the Common six-rowed, Goldthorpe and six-rowed wheat barley proved the best yielders; in 1892 the Duck-bill, New Golden Grains and Mensury take the lead in this respect.

Oats.

Plots sown at the rate of 2½ bushels per acre.

Varieties.	Sown.	Up.	Headed.	Ripe.	Length of Straw.	Number of days to Ripen.	Yield per Plot.	Yield per Acre.
					Ft.		Lbs.	Bush. Lbs.
Prolific Black Tartaria n.	May 13..	May 20..	July 23..	Aug. 30..	2 to 2½	109	77	45 10
Black Tartarian	do 13..	do 20..	do 23..	do 30..	2 to 2½	109	74	43 18
Bonanza	do 13..	do 21..	do 18..	do 25..	4 to 4½	104	60	35 10
Canadian Triumph	do 13..	do 20..	do 16..	do 25..	4½	104	75	42 32
Egyptian	do 13..	do 21..	do 24..	do 30..	3 to 3½	109	86	50 20
Challenge	do 13..	do 22..	do 19..	do 26..	4½ to 5	105	87½	51 16
White Poland	do 13..	do 22..	do 20..	do 26..	4½	105	94	55 10
Rennie's Prize White	do 13..	do 22..	do 17..	do 24..	4¾ to 5	103	80½	47 14
Early Archangel	do 13..	do 20..	do 21..	do 31..	2½ to 3	110	50	29 14
Rosedale	do 13..	do 20..	do 19..	do 31..	3 to 3½	110	52	30 20
Welcome	do 13..	do 20..	do 20..	do 31..	3½ to 4	110	43	25 10
American Triumph	do 13..	do 21..	do 27..	do 31..	3½ to 4	110	35½	20 30
Golden Sided	do 13..	do 21..	do 20..	do 31..	3 to 3½	110	66½	39 4
Victoria Prize White	do 13..	do 21..	do 16..	do 22..	4 to 4½	101	75½	44 14
White Russian	do 13..	do 21..	do 21..	do 26..	3½ to 4	105	44½	26 6
Prolific Black Californian	do 13..	do 20..	do 30..	do 31..	3 to 3½	110	77¼	45 15
Black Brie	do 13..	do 19..	do 2..	Sept. 6..	4 to 4½	117	68¼	41 6
Early Etampes	do 13..	do 18..	do 28..	Aug. 30..	2½ to 3	109	84¼	49 19
Giant Cluster	do 13..	do 21..	do 31..	do 31..	4½ to 5	110	108	63 18
Joanette	do 13..	do 20..	do 24..	Sept. 2..	3 to 3½	112	80¼	47 9
Improved Ligowo	do 13..	do 20..	do 24..	Aug. 30..	4 to 4½	109	123	72 12
Doncaster Prize	do 13..	do 18..	do 24..	Sept. 1..	4½ to 5	111	94¼	55 15
Abundance	do 13..	do 21..	do 25..	Aug. 29..	4½ to 5	108	88¾	52 7
Early Gothland	do 13..	do 19..	do 25..	do 29..	4	108	104¾	61 21
Giant Swedish	do 13..	do 20..	do 26..	do 28..	2 to 2½	107	74	43 18
Hazletts Seizure	do 13..	do 21..	do 27..	do 29..	3 to 3½	108	56½	33 8
Flying Scotchman	do 13..	do 20..	do 29..	do 20..	3½ to 4	99	66	38 28
Early Blossom	do 13..	do 20..	do 31..	do 30..	3½	109	78	45 30
Holstein Prolific	do 13..	do 21..	do 30..	do 23..	3 to 3½	102	37	21 26
Early Race Horse	do 13..	do 19.	do 23..	do 26..	3 to 3½	105	57¾	33 33

Two of the newly imported varieties of French oats, Improved Ligowo and Giant Cluster, head the list as to yield followed by Early Gothland and Doncaster Prize.

SAUNDERS' CROSS-BRED WHEATS.

These were sown with the Planet Junior seed drill, in drills 9 inches apart, and along side were sown fifty grains each of six of the standard varieties of spring wheat, to compare the earliness of the different varieties :—

Varieties.	Amount of Seed Sown.	Date of Sowing.	Came up.	Headed.	Ripe.	Size of Plot.	Yield per Plot.	Yield per Acre.		Days to Mature.
						Square Feet.	Lbs.	Bush.	Lbs.	
Abundance	12 oz.	April 28	May 5	July 2.	Aug. 26	900	42½	34	17	120
White Russian	50 grs	do 28	do 5	do 16.	do 29					123
Alpha	10½ oz.	do 28	do 5	do 1.	do 22	840	36	32	42	116
Anglo Canadian	50 grs	do 28	do 6	do 11.	Sept. 1					126
Beta	9 oz.	do 28	do 6	do 9.	Aug. 30	770	32½	30	28	124
Campbell's White Chaff	50 grs	do 28	do 5	do 6.	do 24					118
Carleton	10½ oz.	do 28	do 6	do 4.	do 23	840	32	27	39½	117
White Fife	50 grs	do 28	do 5	do 8.	do 27					121
Ottawa	5½ oz.	do 28	do 6	do 7.	do 28	460	20	31	34	122
Campbell's Triumph	50 grs	do 28	do 6	do 8.	do 27					121
Prince	2½ oz.	do 28	do 6	do 5.	do 31	240	14	42	21	125
Australian	50 grs	do 28	do 6	do 8.	do 29					123
Bearded Alpha	1¼ oz.	do 28	do 5	do 7.	do 27	120	6	36	18	121
California White	50 grs	do 28	do 8	do 13.	Sept. 4					129

Some of these new varieties have thus far proven to be very productive.

TESTS OF EARLY, MEDIUM AND LATE SOWING ON PLOTS OF ONE-TENTH OF AN ACRE.

Two varieties of each wheat, barley and oats were sown, beginning 12th April and continued each week until 24th May. The land had been fall ploughed, and before each sowing the unsown land was thoroughly harrowed, which may partly explain the heavier yields given by the late sown plots.

The grain on the earlier sown plots is brighter and of better quality than the later ones, and the straw appears to be stiffer, standing up better, also freer from smut. The following gives in detail the result of each test :—

TEST of Spring Wheat, Barley and Oats sown in plots one-tenth of an acre, in successive sowings one week apart.

SPRING WHEAT—RED FIFE.—(Sown at the rate of 1½ bushels per acre.)

Date of Sowing.	Date of coming up.	Heading out.	Harvested	Length of Straw.	No. of days to ripen.	Weight of Grain.	Bushels per acre.		Remarks.
				ft.		$\frac{1}{10}$–acre. lbs.	bush.	lbs.	
Plot No. 1. April 12.....	April 23..	July 2 .	Aug. 16..	3 to 3½	126	193	32	10	Straw bright and stiff; stood up well; heads long and well filled out to tip; grain plump and of good quality.
Plot No. 2. April 19.....	May 2..	do 5..	do 18..	3 to 3½	121	131	21	50	Straw stood up well, but not so well headed as plot No. 1, nor as well stooled; grain plump. Plots No. 2 and 3 were sown on the banks of a small ravine that had been scraped off in levelling, which lowered the yield. This ravine extended across the field and lowered the yield of plots No. 1, 2 and 3 of each variety.
Plot No. 3. April 26	do 5..	do 9..	do 26..	3 to 3½	122	141	28	30	Stood up well and well headed; heads filled to tip; grain plump and bright.
Plot No. 4. May 3.....	do 12..	do 11..	do 27..	3 to 3½	116	194	32	20	Stood up well and stooled very well; heads very long and well filled out to tip; grain plump.
Plot No. 5. May 10.....	do 16..	do 14..	do 30..	3 to 3½	112	172½	28	45	Straw strong; heads long and well filled, but grain not so good in quality, being darker and softer than plots 1, 2 and 3.
Plot No. 6. May 17..	do 23..	do 17..	Sept. 4..	3 to 3½	110	191	31	50	Stood up well and was well stooled; heads long and well filled; grain soft and dark.
Plot No. 7. May 24.....	June 2..	do 22.	do 7..	3	106	131½	21	55	Stood up well, but did not stool out as well as any of the others, and the grain was not so bright or hard.

CAMPBELL'S WHITE CHAFF—(Sown at the rate of 1½ bushels per acre.)

Plot No. 1. April 12.... ...	April 23..	June 24..	Aug. 12..	3 to 3½	122	150½	25	5	Heads good length and well filled out; grain plump and bright.
Plot No. 2. April 19.....	May 3..	July 1..	do 16..	3 to 3½	119	130	21	40	do do straw bright and stiff; did not stool well.

Plot No. 3. April 26	do	5..	do	6..	do	18..	3	114	108	18	00	Heads fair length and well filled, but thin on ground.
Plot No. 4. May 3.....	do	12..	do	9..	do	22..	3 to 3½	110	170	28	20	Stood up well and was well stooled; heads long and well filled.
Plot No. 5. May 10.....	do	17..	do	14..	do	27..	3 to 3½	109	168	28	00	Straw soft and lodged; heads long and well filled.
Plot No. 6. May 17.....	do	23..	do	17.	do	30..	3 to 3½	105	163	27	10	Badly lodged; heads fair length.
Plot No. 7. May 24.....	June	2..	do	22..	Sept.	5..	3	104	106½	17	45	Very poor stand; did not stool; straw soft and crinkled down.

BARLEY, TWO-ROWED—PRIZE PROLIFIC—(Sown at the rate of two bushels per acre).

April 12	April	20..	June	29..	Aug.	6..	3 to 3¼	116	149½	31	7	Stood up well; did not stool well; heads long; no smut.
Plot No. 2. April 19	May	2..	July	1..	do	9..	3 to 3½	112	175¾	36	29½	Badly lodged but well stooled; heads long; grain plump and bright.
Plot No. 3. April 26	do	3..	do	4..	do	10..	3 to 3½	106	134	27	44	Lodged early and did not fill well; heads long; no smut.
Plot No. 4. May 3.....	do	10..	do	8..	do	17..	3½	106	188¼	39	10½	Stood up well and was well stooled; heads long and grain plump; no smut.
Plot No. 5. May 10.....	do	17..	do	13..	do	19..	3½	101	161¼	33	28½	Partly lodged; did not stool well; heads medium; no smut.
Plot No. 6. May 17.....	do	24..	do	16..	do	25..	3½	101	199	41	22	Crinkled down but well stooled; heads long; no smut.
Plot No. 7. May 24.....	June	2..	do	24..	Sept.	5..	3 to 3¼	104	168	35	00	Crinkled down; fairly well stooled, but not well headed; a little smut.

TESTS of Spring Wheat, Barley and Oats sown in plots one-tenth of an acre, in successive sowings of one week apart—*Continued.*

BARLEY, SIX-ROWED—BAXTER'S SIX-ROWED—(Sown at the rate of two bushels per acre).

Date of Sowing.	Date of Coming up.	Heading out.	Harvested	Length of Straw.	No. of Days to Ripen	Weight of Grain.	Bushels per Acre.		Remarks.
				Feet.		$\frac{1}{10}$ acre. Lbs.	Bush.	Lbs.	
Plot No. 1. April 12.....	April 20..	June 22..	July 29..	2½ to 3	109	160	33	16	Heads long; grain plump and bright; straw thin, and did not stool well; no smut.
Plot No. 2. April 19.....	May 1..	do 27..	Aug. 1..	2½ to 3	105	110	22	45	Stood up well, but was not well stooled; heads fair length; no smut.
Plot No. 3. April 26.....	do 3..	do 29..	do 3..	2½ to 3	100	128½	26	37	Stood up well; fairly well stooled; heads medium; grain plump.
Plot No. 4. May 4.....	do 11..	July 1..	do 6..	3	94	155	32	14	Stood up fairly well; very well stooled; grain plump; a little smut.
Plot No. 5. May 10.....	do 18..	do 5..	do 9..	3 to 3½	91	172	35	40	Stood up well; stooled very well; heads medium; grain plump.
Plot No. 6. May 17.....	do 23..	do 11..	do 16..	2½ to 3	91	196	40	40	Straw short, but stooled well; heads long, and grain plump; very little smut.
Plot No. 7. May 24.....	do 30..	do 15..	do 22..	2½ to 3	90	174	36	12	Straw short, and considerably crinkled down; heads good; no smut.

OATS—PRIZE CLUSTER—(Sown at the rate of 2½ bushels per acre).

Plot No. 1. April 12.....	April 21..	July 1..	Aug. 8..	4 to 4½	119	128	37	22	Stood up well; grain bright and plump; no smut.
Plot No. 2. April 19.....	May 2..	do 6..	do 13..	4 to 4½	117	165	48	18	Straw strong; grain bright and plump; no smut.
Plot No. 3. April 26.....	do 6..	do 9..	do 18..	3 to 3½	115	132	38	28	Stood up well, but did not stool well; no smut.

Plot No. 4. May 3	do	14	do	13	do	19	3½	108	157	46	7	Stooled well, but straw soft and lodged.
Plot No. 5. May 10	do	19	do	16	do	22	3½	104	151	44	14	Straw soft and crinkled down; a little smut.
Plot No. 6. May 17	do	25	do	18	do	26	3¼ to 3½	101	175	51	16	Stooled well, but straw badly lodged; a little smut.
Plot No. 7. May 24	June	1	do	22	Sept.	3	3¼ to 4	102	177	52	2	Stooled well; heads long; badly lodged.

OATS—BANNER—(Sown at the rate of 2½ bushels per acre).

Plot No. 1. April 12	April	21	July	2	Aug.	13	3½ to 4	124	181	53	8	Straw stiff and fairly well stooled; grain bright and plump.
Plot No. 2. April 19	May	2	do	8	do	16	3½ to 4	120	177	52	2	Stood up well; grain bright and plump.
Plot No. 3. April 26	do	6	do	12	do	18	4	115	193½	56	31	Stood up well; grain bright and plump.
Plot No. 4. May 3	do	12	do	16	do	22	4	112	258	75	31	Stood up well; well stooled; grain bright and plump; very little smut.
Plot No. 5. May 10	do	19	do	18	do	27	4	110	273	80	10	Well stooled; long heads and well filled out; straw slightly lodged.
Plot No. 6. May 17	do	24	do	20	do	30	4	105	282	82	32	Well stooled; good heads; straw soft and lodged.
Plot No. 7. May 24	June	3	do	26	Sept.	5	4	104	299½	88	2	Well stooled; long and well filled heads; lodged.

Field Pease.

Sown in plots of one-tenth of an acre, all sown at the same time, and under similar conditions, the soil and treatment being the same.

Varieties.	Amount Sown per Acre.	Date of Sowing.	Up.	Ripe.	Yield per Plot.	Yield per Acre.	Number of Days to Ripen.
	Bush.				Lbs.	Bush. Lbs.	
Prince Albert	2½	April 16..	May 2..	Aug. 25..	274	45 40	131
Mummy	2½	do 16..	do 2..	do 22..	298	49 40	128
Prussian Blue	2½	do 16..	do 3..	do 26..	126	21 00	132
Crown	2½	do 16..	do 3..	do 13..	179	29 50	119
Pride	2½	do 16..	do 3..	do 17..	126½	21 5	123
Rennie's No. 10	2½	do 16..	do 2..	do 27..	122½	20 25	133
White Marrowfat	3	do 16..	do 2..	do 11..	140	23 20	117

Garden Pease.

One pound of garden pease of each of the following varieties were sown April 30th:—

Varieties.	Sown.	Up.	Fit for Table use.	Remarks.
Kentish Invicta	April 30..	May 14..	July 2..	Pods very short and not many on the vines.
Extra Early Star	do 30..	do 15..	June 30..	Pods good length, well filled, pea small.
Little Gem	do 30..	do 14..	July 4..	Pods short but well filled.
Telephone	do 30..	do 15..	do 16..	Pods long and well filled, pea large.
Bliss' Abundance	do 30..	do 16..	do 21..	Pods medium.
Tom Thumb	do 30..	do 24	do 6..	Long pods, well filled.
Early Kent	do 30.	do 25..	do 7..	Pods medium in size, pea medium.
Blue Peter	do 30..	do 16..	do 8..	Pods medium, not well filled.
First and Best	do 30..	do 17..	do 1..	Pods medium, well filled.
American Wonder	do 30..	do 17..	do 5..	do do
Horsfords	do 30..	do 15..	do 16..	do do
Ringleader	do 30 .	do 17..	do 10..	do do
Laxton's Alpha	do 30..	do 17..	do 5..	Peas very large and very fine flavoured, but pods only medium, not well filled.
Duke of Albany	do 30..	do 17..	do 9..	Pods large, well filled with large peas of excellent quality.
Champion of England	do 30..	do 16..	do 20..	Pods medium in length, not well filled.
Extra Early	do 30..	do 15..	do 2..	Pods medium, well filled, quality poor.
Blue Imperial	do 30..	do 17..	do 22..	Pods long and well filled with large peas of good quality.
Extra Early Brittany	do 30..	do 16..	do 7..	Pods short and not well filled.
Laxton's Surprise	do 30..	do 17..	do 18 .	Pods long, well filled with large peas of first quality.
Stratagem	do 30..	do 16..	do 20.	Pods long and well filled, peas large and good.

Turnips.

Twelve varieties of turnips were tested, under similar conditions.

Two lots of each variety were sown, one on 3rd May, the other 14 days later —17th May.

The yield of the plots and the yield per acre is given below, both in bushels and tons.

Varieties.	Date of sowing.	Harvested	Yield per Plot.	Yield per Acre.	Yield per Acre.
			Lbs.	Tons. Lbs.	Bush. Lbs.
Marquis of Lorne—					
Lot No. 1	May 3..	Nov. 17..	610	26 1,724	895 24
do 2	do 17..	do 17..	412	18 300	605 00
Carter's Elephant—					
Lot No. 1	do 3..	do 17..	709½	31 436	1,040 24
do 2	do 17..	do 17..	388½	17 188	569 48
Jumbo—					
Lot No. 1	do 3..	do 17..	544½	23 1,916	798 36
do 2	do 17..	do 17..	415	18 420	607 00
Prize Purple Top—					
Lot No. 1	do 3..	do 17..	433¼	19 126	635 26
do 2	do 17..	do 17..	289	12 1,432	423 52
Purple Top—					
Lot No. 1	do 3..	do 17..	462	20 556	675 56
do 2	do 17..	do 17..	310	13 1,280	454 40
Hartley's Bronze Top—					
Lot No. 1	do 3..	do 17..	404¾	17 1,601½	593 21½
do 2	do 17..	do 17..	199½	8 1,556	292 36
Elephant—					
Lot No. 1	do 3..	do 17..	688½	30 588	1,009 48
do 2	do 17..	do 17..	330	14 1,040	484 00
Mammoth Purple Top—					
Lot No. 1	do 3..	do 17..	499¼	21 1,934	732 14
do 2	do 17..	do 17..	335	14 1,480	491 20
Bangholm—					
Lot No. 1	do 3..	do 17..	462	20 656	677 36
do 2	do 17..	do 17..	336	14 1,590	493 10
Sutton's Champion—					
Lot No. 1	do 3..	do 17..	412½	18 300	605 00
do 2	do 17..	do 17..	337¼	14 1,678	494 38
Prize Winner—					
Lot No. 1	do 3..	do 17..	467	20 1,096	684 56
do 2	do 17..	do 17..	353½	15 910	516 50
Bronze Top Extra—					
Lot No. 1	do 3..	do 17..	442½	19 918	648 38
do 2	do 17..	do 17..	305¾	13 900	448 20

These results corroborate those of last year, and point clearly to the advantage of the early sowing of field turnips in this climate.

Mangels.

Twelve varieties of Mangels were sown in two plots each. One of each variety was sown on 2nd May and the second sowing was on 16th May.

Varieties.	Sown.	Up.	Yield per Plot.	Yield per Acre.	Yield per Acre.
			Lbs.	Tons. Lbs.	Bush. Lbs.
Red Globe—					
Lot No. 1	May 2..	May 13..	266½	11 1,452	390 51
Lot No. 2	do 16..	do 27..	140¼	6 321	205 20
Mammoth Long Red—					
Lot No. 1	do 2..	do 13..	336¾	14 1,634	493 54
Lot No. 2	do 16..	do 26..	203¾	8 1,930	298 50
Mammoth Long Red—					
Lot No. 1	do 2..	do 13..	359¼	15 1,614	526 54
Lot No. 2	do 16..	do 28..	162¾	7 322	238 42
Red Fleshed Tankard—					
Lot No. 1	do 2..	do 14..	328½	14 908	481 48
Lot No. 2	do 16..	do 27..	202¼	8 1,798	296 38
Red Globe—					
Lot No. 1	do 2..	do 15..	296½	13 92	434 52
Lot No. 2	do 16..	do 28..	215½	9 964	316 04
Berkshire Prize—					
Lot No. 1	do 2..	do 14..	223¾	9 1,690	328 10
Lot No. 2	do 16..	do 26..	157¾	6 1,882	231 22
Mammoth Long Red—					
Lot No. 1	do 2..	do 13..	327	14 776	479 36
Lot No. 2	do 16..	do 28..	181	7 1,928	265 28
Giant Yellow Intermediate—					
Lot No. 1	do 2..	do 14..	256¾	11 594	376 14
Lot No. 2	do 16..	do 26..	176	7 1,488	258 8
Carter's Warden—					
Lot No. 1	do 2..	do 14 .	292½	12 1,740	429 ..
Lot No. 2	do 16..	do 27..	185½	8 324	272 4
Canadian Giant—					
Lot No. 1	do 2..	do 15..	270¾	11 1,826	397 6
Lot No. 2	do 16..	do 28..	148¼	6 1,046	217 26
Yellow Globe—					
Lot No. 1	do 2..	do 15..	160¾	7 146	235 46
Lot No. 2	do 16..	do 26..	151¾	6 1,354	222 46
Golden Fleshed Tankard—					
Lot No. 1	do 2..	do 14..	261	11 968	382 48
Lot No. 2	do 16..	do 27..	250	11	386 40

The yield of a similar series of plots of Mangels in 1891 was very much larger than in the above, running from 31 to 69 tons per acre, but they were sown earlier—on the 9th and 23rd of April. A few plots sown from the 8th to the 25th of May did almost equally well, showing that the season of 1892 has been unfavourable for this crop.

Carrots.

Twelve varieties of carrots were tested in the same way, and under similar conditions as the turnips. The first sowing was on 30th April, the second on 14th May. Soil and treatment the same in each case.

Varieties.	Date of Sowing.	Harvested.	Yield per Plot.	Yield per Acre.		Yield per Acre.	
				Tons.	Lbs.	Bush.	Lbs.
Early Gem—							
Lot No. 1	April 30..	Nov. 18..	218½	9	1228	320	28
Lot No. 2	May 14..	do 18..	206¾	9	194	303	14
Chantenay—							
Lot No. 1	April 30..	do 18..	296¼	13	114	435	14
Lot No. 2	May 14..	do 18..	240	10	1120	352	00
White Intermediate—							
Lot No. 1	April 30..	do 18..	394½	17	716	578	36
Lot No. 2	May 14..	do 18..	224	9	1712	328	52
Half Long—							
No. 1	April 30..	do 18..	308¾	13	1170	452	50
No. 2	May 14..	do 18..	286¾	12	1034	417	14
Guerande—							
Lot No. 1	April 30..	do 18..	327	14	776	479	36
Lot No. 2	May 14..	do 18.	272¾	12	42	400	42
Orange Giant—							
Lot No. 1	April 30..	do 18..	272¼	11	1958	399	18
Lot No. 2	May 14..	do 18..	159	6	1992	233	12
Improved Short White—							
Lot No. 1	April 30..	do 18..	352¾	15	1042	517	22
Lot No. 2	May 14..	do 18..	223¼	10	538	340	38
Mammoth Intermediate Smooth White—							
Lot No. 1	April 30..	do 18..	365¼	16	102	535	2
Lot No. 2	May 14..	do 18..	218¾	9	1270	321	10
Danvers—							
Lot No. 1	April 30..	do 18..	262½	11	1100	385	00
Lot No. 2	May 14..	do 18..	157½	6	1860	231	00
Iverson's Champion—							
Lot No. 1	April 30..	do 18..	250¾	11	66	367	46
Lot No. 2	May 14..	do 18..	152½	6	1420	223	40
Vosges—							
Lot No. 1	April 30..	do 18..	217¾	9	1162	319	22
Lot No. 2	May 14..	do 18..	137¼	6	78	201	18
Large White Belgian—							
Lot No. 1	April 30..	do 18..	246½	10	1692	361	32
Lot No. 2	May 14..	do 18..	171¾	7	1114	251	54

These results, like those of 1891, show the advantage of early sowing.

Sugar Beets.

Four varieties of sugar beets were sown alongside of each other in rows 30 inches apart, and treated alike. The crowns of the roots were kept covered with earth during the period of growth. None of the roots were larger than four lbs. They yielded as follows :—

Varieties.	Sown.	Up.	Harvested.	Yield per Plot.	Yield per Acre.		Yield per Acre.	
					Tons.	Lbs.	Bush.	Lbs.
Vilmorins' Improved	May 19.	May 31.	Dec. 5	218½ lbs.	9	1,228	320	28
Klein Wanzleben	May 19.	May 31.	Dec. 5	90 lbs.	3	1,920	99	00
Brabant	May 19.	May 31.	Dec. 5	150 lbs.	6	1,200	220	00
Kruger	May 19.	May 31.	Dec. 5	137 lbs.	6	56	201	56

Potatoes.

Twenty-two varieties were tested, to find what effect spraying with Bordeaux Mixture would have in preventing the blight of the tops and rotting of the tubers.

They were planted in rows three ft. apart, and the sets, one ft. in the row. The sets were cut to two strong eyes, and the vines were sprayed twice, July 19th and 28th. As the ground had been ploughed for the first time in August of the previous year, the yield was not large in any case, but I think the results given show that this year, although there was no rot, yet spraying arrested the blighting in the tops, and by so doing increased the yield.

Varieties.	Planted.	Up.	Dug.	Marketable. Sprayed.	Not Marketable. Sprayed.	Total.	Marketable. Not Sprayed.	Not Marketable. Not Sprayed.	Total.	Yield per Acre Sprayed.		Yield per Acre Not Sprayed.	
				Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Empire State	May 23.	June 16.	Oct. 11.	40	15	55	53	13	66	134	26	166	13
Ohio Gunner	do 23.	do 16.	do 11.	16	20	36	18	21	39	88	00	95	20
Ohio Junior	do 23.	do 16.	do 11.	24	14	38	22	16	38	92	54	92	54
Chicago Market	do 23.	do 16.	do 11.	39	11	50	28	11	39	122	13	95	20
Brownell's Winner	do 23.	do 16.	do 11.	28	18	46	20	14	34	112	26	83	16
Clarke's No. 1	do 23.	do 17.	do 11.	36	16	52	32	12	44	127	6	107	32
Delaware	do 23.	do 17.	do 11.	38	13	51	32	17	49	124	40	119	46
Algoma No. 1	do 23.	do 17.	do 11.	29	13	42	15	7	22	102	40	53	46
Early Puritan	do 23.	do 16.	do 11.	31	9	40	32	9	41	97	46	100	12
Rose's New Giant	do 23.	do 17.	do 11.	33	5	38	21	6	27	92	53	66	00
Early Maine	do 24.	do 17.	do 11.	23	12	35	21	12	33	85	33	80	40
Lee's Favourite	do 24.	do 16.	do 11.	21	20	41	24	19	43	100	12	105	6
Vanguard	do 24.	do 16.	do 12.	16	13	29	15	7	22	70	53	53	46
White Star	do 24.	do 18.	do 12.	16	19	35	15	16	31	85	33	75	46
Rochester Favourite	do 24.	do 17.	do 12.	17	18	35	18	19	37	85	33	90	26
Green Mountain	do 24.	do 18.	do 12.	15	18	33	17	12	29	80	40	70	53
London	do 24.	do 18.	do 12.	21	21	42	10	12	22	102	40	53	46
Thorburn	do 24.	do 18.	do 12.	19	11	30	14	6	20	73	20	48	53
Early Eating	do 24.	do 17.	do 12	12	5	17	11	5	16	41	33	39	6
Halton Seedling	do 24.	do 18.	do 12.	14	16	30	14	13	27	73	20	66	00
Early Rose	do 24.	do 17.	do 12.	14	15	29	15	10	25	70	53	61	6
Rural Blush	do 24.	do 19.	do 12.	13	15	28	12	13	25	68	26	61	6

A series of plots of potatoes were also planted, beginning March 25th and continued at intervals of one week until June 3rd, to test the merits of cut versus whole seed, and early and late planting.

The rows were planted three feet apart, and one foot apart in the rows. The sets were cut to two strong eyes, and the whole potatoes would average about three sets if cut.

The land had been in cultivation for some time, and had received a light dressing of stable manure for the previous crop of mangels.

Planted.	Up.	Yield per Acre.	Seed.
		bush. lbs.	
March 25	April 18	220 13	Cut sets.
do 25	do 15	283 8	Whole potatoes.
April 1	do 22	283 18	Cut sets.
do 1	do 22	338 48	Whole potatoes.
do 8	do 26	237 10	Cut sets.
do 8	do 25	312 11	Whole potatoes.
do 15	do 29	316 20	Cut sets.
do 15	do 29	338 39	Whole potatoes.
do 22	May 6	316 18	Cut sets.
do 22	do 6	333 57	Whole potatoes.
do 29	do 14	280 43	Cut sets.
do 29	do 14	396 53	Whole potatoes.
May 6	do 18	205 42	Cut sets.
do 6	do 18	281 20	Whole potatoes.
do 13	do 24	256 31	Cut sets.
do 13	do 24	290 24	Whole potatoes.
do 20	do 30	171 49	Cut sets.
do 20	do 30	343 38	Whole potatoes.
do 27	June 8	212 57½	Cut sets.
do 27	do 8	244 25	Whole potatoes.
June 3	do 18	106 29	Cut sets.
do 3	do 18	154 53	Whole potatoes.

Fodder Plants.

A small quantity of the seed of the following fodder plants was received from the Central Experimental Farm, and sown 26th May to 4th June. As there was only a small quantity of each, they were allowed to ripen for the seed.

Varieties.	Sown.	Up.	Length of Straw.	Length of Heads.	Remarks.
			Feet.	Inches.	
Hungarian Grass	May 26.	June 9.	4	2 to 4	Did not stool; cut Sept. 10.
Chana Millet	do 26.	do 11.	4 to 4½	6 to 10	Did not stool freely; ripe Sept. 30.
Branching Millet	do 26.	do 12.	4 to 5	4 to 8	Stooled well, had a great deal of foliage; promises to be desirable for fodder; ripe Sept. 30.
Long-Headed Millet	do 26.	do 13.	5	5 to 10	A heavy crop; should be a desirable fodder plant; ripe Sept. 14.
Canary seed	do 27.	do 12.	4½	½ to 2	Stalks slender and bare; ripe Sept. 10.
Red Millet	do 27.	do 14.	4 to 4½	4½ to 6	Did not stool freely, but well furnished with foliage; ripe Sept 14.
Italian Millet	do 27.	do 8.	4½ to 5	5 to 8	Did not stool; a light crop; ripe Sept. 14.
Black Millet	June 3.	do 12.	4	4 to 6	Not a heavy cropper; heads very thin; ripe Sept. 4.
Choice Round White Millet	do 4.	do 13.	5	7 to 9	Did not stool; only a light crop; ripe Sept. 14.
Round White Millet	do 4.	do 11.	5	6 to 10	Stooled fairly well; ripe Sept. 5.
Californian Green Millet	do 4.	do 12.	3 to 3½	2 to 3	Stalks slender and bare; a poor crop; Sept. 7

Lathyrus Sylvestris Wagneri.

This plant has made a vigorous growth again this year, and as there has been considerable inquiry for seed, we let it ripen, so that there might be a quantity of seed for distribution.

The seed raised last year was distributed in small quantities throughout the dry grazing lands of the interior, and as far east as Calgary in the North-west Territories.

A small quantity of the seed was sown on the farm in April, it came up, but has only made a growth of about 10 inches.

Reports have been received from two parties in the Territories, to whom were given a few seeds, Mr. W. Pearce and Mr. Oscar Moorehouse, both of Calgary, and in each case a growth of from 6 to 10 inches was made.

Summer Fallow.

The piece of new land summer-fallowed last year, to kill the ferns, has been a fair success, very few ferns showing this year, and I believe if thoroughly done, and followed by a hoed crop, that the ferns would give very little after trouble.

Cross-Fertilizing and Hybridizing.

Early in July, Mr. A. P. Saunders paid the farm a visit for the purpose of doing some cross-fertilizing and hybridizing. Crosses were attempted between eleven varieties of fall and spring wheats, covering twenty-three heads; also between twelve different varieties of peas. Efforts were also made to hybridize the wild and cultivated vetch, blue lupin and Lathyrus sylvestris with the cultivated pea, twenty-nine blossoms being operated on.

The endeavour was made to cross four varieties of oats, covering seven heads; also six varieties of barley covering eight heads.

Quite a number of these have been successful, and the produce will be carefully sown and cared for next year, in the hope that something of merit may result.

Hedge.

About 500 yards of one year old osage orange plants were set out along the north fence for a hedge. They have made a fair growth, and will show in a few years whether osage orange is suitable for fencing in this climate.

Shelter Belt.

A shelter belt, 50 yards wide and 25 chains long, of mixed forest trees, such as ash, maple, white pine, &c., was planted along the north fence. The trees are growing well and will soon make quite a showing.

Distribution of Grain and Potatoes.

A large number of samples of seed grain and potatoes were distributed from the farm last year among the farmers of this province, but up to the present time no reports have been received as to their success.

Fish Guano.

A ton of fish guano was purchased from one of the canneries in the spring, and tested on peas, oats, wheat and different kinds of root crops in quantities varying from 100 to 400 lbs. per acre, and the produce weighed.

The plots will be sown or planted with the same varieties next year, to ascertain what effect the fertilizer has, and if it is lasting, but it will require a series of tests to satisfactorily determine whether it will pay to use it at the present price of $25 per ton.

Strawberries.

The spring frosts injured the crop of strawberries to a considerable extent, but several varieties gave very fair returns.

Quite a number of the varieties tested are not worth keeping, some, on account of feeble growth and unproductiveness, others on account of the poor quality of the fruit.

The following, are the notes taken this year.

Varieties.	Fruit ripe.		Remarks.
1. Bubach	June	10.	Berry large to very large, and borne on very long stems, well up from the ground; good for home use, or for shipping; plants vigorous and prolific, carries size of berries to end of season.
2. Sharpless	do	10.	Berries large to very large, irregular in shape; flavour good; productive, stem long and strong, a vigorous healthy grower.
3. Wilson	do	11.	Berries medium in size, firm and regular in shape; prolific; plant vigorous and healthy.
4. Black Giant	do	12.	Berry large and regular in shape, moderately firm; quality fair; plant vigorous, healthy and productive.
5. Cumberland Triumph	do	9.	Berry medium in size; productive, a good home berry.
6. Gandy	do	10.	Berry good size colour and shape; flavour good; prolific, stem long and holds fruit well up; vigorous grower, foliage healthy, one of the best.
7. Maggie	do	5.	Berry medium and even in size; prolific; carries size to the last of the season; inclined to be soft, stem very short.
8. Prince of Berries	do	14.	Berry bright red, firm and prolific; a good many imperfect berries; vigorous healthy grower.
9. Pineapple	do	12.	Berry above medium in size, long and irregular, does not ripen out to the tip.
10. Belmont	do	6.	Berry long and large, poor flavour, and soft; prolific; a vigorous grower, but does not ripen to tips.
11. Bordelaise	do	19.	Berry small and imperfect, too dark in colour; poor cropper, not desirable.
11. Capt. Jack	do	10.	Berry small and soft; poor flavour; not prolific; foliage rusty; a feeble grower.
13. Norman	do	9.	Berry very irregular in size, ranging from very small to large; too soft to ship; very feeble grower not desirable.
14. Itasca	do	5.	Berry medium to small, soft; foliage rusty.
15 May King	do	12.	Berry medium to small in size, good colour and shape, inclined to be soft, not very prolific; plant vigorous and healthy.
16. Hathaway	do	10.	Berry uneven in size and bad shape, inclined to be soft; not very prolific; not desirable.
17. Seneca	do	11.	Berry medium in size, a large per cent imperfect, and runs to very small late in the season.
18. Manchester	do	10.	Berry medium in size, firm, good shape and appearance; only moderately prolific.
19. James Vick	do	18.	Plant a strong, vigorous grower; foliage healthy; productive; berry very small.
20. Woodruff	do	13.	Berry medium to small, poor shape; foliage rusts badly.
21. Jumbo	do	7.	Berry irregular in size, running from small to very large; prolific and firm; stem short; foliage healthy and plant vigorous.
22. Emerald	do	10.	Berry small and many imperfect; foliage rusty.
23. Chas. Downing	do	13.	Berry good size and shape; fairly prolific; plant vigorous, but foliage very rusty.
24. Photo	do	13.	Berry large and firm; plant vigorous and healthy, but not prolific.
25. Windsor	do	11.	Berry medium in size and firm; carries size to end of season; not prolific; plant vigorous and healthy.
26. Atlantic	do	13.	Berry uneven in size and irregular in shape; too soft to ship well; a weak grower and foliage rusty; not prolific.
27. Wonderful	do	9.	Berry above medium in size, good shape and borne on long stems; a good shipper; plant vigorous and healthy; very prolific, and berries maintain their size to end of season.
28. Mrs. Garfield	do	10.	Berry large and fine looking, but soft; plant a feeble grower, and not productive.
29. Jersey Queen	do	13.	Berry small to medium, and many imperfect, soft and poor in quality plant vigorous; foliage healthy; not a good cropper.
30. Mary Fletcher	do	9.	Berry large and good shape, of good flavour, but too soft for shipping plant vigorous and healthy; only moderately productive.
31. Crescent	do	14.	Berry small and poor; not desirable.
32. Old Ironclad	do	12.	Berry very small and poor in quality; plant vigorous and healthy but not productive.
33. Osceola	do	9.	Berry very small and poor; not worth keeping.

STRAWBERRIES—*Concluded.*

Varieties.	Fruit ripe.	Remarks.
34. Connecticut Queen...	June 16..	Berry large to medium; too soft to ship well; plant vigorous and moderately prolific.
35. Warfield, No. 2.....	do 8..	Berry medium to very small, sour and soft; plant moderately vigorous, and foliage healthy; not prolific.
36. New Dominion.....	do 10..	Berry very uneven in size; quality fair, a little soft; plant only moderately vigorous; foliage rusty; not very productive.
37. Jessie.....	do 9..	Berry medium to large, firm and of good appearance; plant vigorous; foliage healthy; berries borne on long stems; productive.

RASPBERRIES.

Varieties.	Ripe.	Remarks.
Cuthbert...	June 27..	Berries very fine and a good cropper; canes vigorous.
Marlboro.....	do 21..	Berry fair size and fine looking, liable to drop off as soon as ripe.
Turner.....	July 2..	Too small for profit.
Caroline...	June 23..	Very small and poor.
Brandywine	do 25..	Very small, canes slender and feeble.
Heebner.....	do 29..	Medium in size but very soft.
Hansell...	July 8..	A very poor berry; too small and not productive.
Golden Queen.....	June 27..	Berry of good size and fine appearance; flavour fine; not very productive

Saunders' Seedlings.

3-13..	July 3..	Berry fair size; uneven; not productive.
3-7...	June 27..	Size, small to large; soft, not a good stripper; flavour very fine.
3-11 yellow.....	do 26.	Fine large berry, good flavour and productive; plant vigorous, but too soft for shipping.
3-39.....	do 30..	Berry large; very productive; flesh firm; plant vigorous.
4-38..	July 9..	Berry large, even in size, firm and productive; one of the best.
3-74.....	June 28..	Berry medium to very large; firm, good shape and flavour; productive.
8-72...	do 24..	Berry too small and imperfect; not desirable, as it comes to pieces in picking.

BLACKBERRIES.

Only three varieties, which were planted in the spring of 1890, have fruited:—

Varieties.	Ripe.	Remarks.
Snyder.....	July 21..	Productive, and good quality.
Agawam.....	do 20..	Good size, and very productive.
Taylor's Prolific.....	do 22..	Good size, prolific, and fair quality.

CURRANTS.

Several varieties each of the red, white and black currants fruited this year.

As the bushes are young the yield was very light, but as they made a healthy growth, there is every promise of a better return next year.

Gooseberries.

Five each, of the following varieties were received from England last spring:—

Leader, Bonny Lass, Ladnes Lady, Warrington, King of Trumps, Telegraph, Duckwing, Westbandman and Pilot.

The season was well advanced when they arrived, and only a few of them made any growth.

Several of those planted in the spring of 1890 gave a few berries.

Lucretia Dewberries.

These fruited this year. I do not think that they have any good qualities to recommend them.

The fruit was very irregular in size, and many berries imperfect, and the flavour was poor.

Apples.

The apple trees have made a uniformly healthy vigorous growth.

The following varieties produced from one to half a dozen apples each:—

Alexander,
American Golden Russet,
Bombshell,
Canada Red,
Colvert,
Duchess of Oldenburg,
Fameuse,
Early Harvest,
Grimes Golden,
Haas,
Hurlburt,
Jersey Sweet,
Keswick Codlin,
Longfield,
Maiden's Blush,
Oregon Red Cheek,
Ribston Pippin,
Rolfe,
Seek no Further,
Scott's Winter,
Smith's Cider,
Tetofsky
Wellington,
Wealthy,
Yellow Siberian,
McMahon's White,
General Grant,
Hyslop.

Pears.

A few of the pear trees blossomed last spring, but only the Keiffer fruited.

We had several pears of that variety both on the standard and dwarf trees.

There have been no losses among the pear trees, and all have made a very fine growth.

Plums.

All the plum trees have made a very fine growth.

Several of the earlier varieties were caught by the late spring frost and the fruit killed.

The following varieties fruited:—

Damson, ripe 10th September.
Reine Claude, ripe 20th September, fruit burst on tree.
Lombard, ripe 10th September.
Coe's Golden Drop, ripe 24th September.
Bleeker's Gage, ripe 28th September.
Saunders, ripe 16th August.
Moore's Arctic, ripe 30th August.
Gueii, ripe 5th September.
Duane's Purple, ripe 9th September
Peach Plum, ripe 28th August.
Pond's Seedling, ripe 9th September.
Red Egg, ripe 5th September.
Prune d'Agen, ripe 20th September.
German Prune, ripe 25th September, fruit badly burst.
Munro, ripe 10th September.

Apricots.

The apricot trees have all lived, and they have made a very healthy growth, but owing to the spring frosts have not given any fruit this year.

Nectarines.

The curl leaf affected the nectarine trees so badly in May and June, that two trees died, viz., one Pitmaston's Orange and one Early Violet. The other trees of these varieties and the Victoria made a feeble growth until July. Since then they have made a fair growth. The Early Violet was one of those that escaped curl leaf altogether last year.

All the other varieties made a vigorous growth, and if no spring frosts occur next year they will no doubt give a crop of fruit.

Peaches.

The spring frosts cut off the crop of peaches, and the injury by frost was followed by a severe attack of curl leaf.

Only five varieties of those planted in the valley escaped curl leaf, viz., Early Crawford, Malta, Foster, Wager and Surpasse Melocoton. These, although planted alongside, and the soil and treatment the same, were not affected.

Some trees which made a most vigorous growth in 1890 and 1891 suffered the most injury this year, having made scarcely any new growth. The trees planted on the bench lands, did not suffer so much, and appeared to recover much more rapidly than those in the valley. None of the trees have died, and perhaps they will recover lost ground next year.

Cherries.

The cherry trees have made a vigorous growth and the following varieties fruited :—

Early Purple Guigne, ripe 15th June.
Parent, ripe 9th July, fruit small.
Black Heart, ripe 18th June, fruit split very badly.
Cumberland, ripe 24th June, fruit very fine and large.
Lieb, ripe 18th June, fruit medium size.
English Morello, ripe 15th July.

Bench Orchards.

Since my last report, two orchards of mixed fruits, viz. : apples, pears, plums, peaches and nectarines, have been set out on the bench land.

One orchard of 241 trees at an altitude of from 245 feet at the lowest point, to 410 at the highest ; and one of 93 trees, ranging from 725 feet at the lowest point to 825 feet at the highest point above the orchards on the level land of the farm.

The soil on these benches is a warm loam, and judging from the growth made by the trees planted, is well adapted for fruit trees, and is considerably earlier than in the valley, and will no doubt be less liable to late frosts in the spring.

These orchards together with those previously planted on the first bench in the spring of 1890 make a total planted on the benches of 473 trees of apple, pear, peach, plum, cherry, nectarine and apricot, and with very few exceptions they have made a satisfactory growth.

About 30 grape vines have been added to those planted on the bench in the spring of 1890, and although none have yet fruited they have made a strong growth, and coming into leaf earlier in spring, will likely ripen their fruit earlier than the same varieties on the level land.

Grapes.

The following varieties of grapes fruited this year, but owing to the autumn being very wet, only six varieties ripened.

Jessica, ripe 15th October.
Florence, ripe 18th October.
Brighton, did not ripen.
Worden "

Wyoming, ripe 20th October.
Champion, ripe 14th October.
Eldorado, ripe 22nd October.
Buchanan, ripe 28 October.
Concord, did not ripen.
Delaware "
Wilder "
Amber Queen "
Moore's Early "
Martha "
Niagara "
Hartford "
Massasoit "
August Giant "
Rogers No. 28 "
Agawam "
Salem "
Lindley "
Herbert, did not ripen.
Empire State "
Rogers No. 39 "
Bacchus "
Wonder "
Arnold's No. 8 "
Secretary "
Eva "
Noah "
Marion "
Arnold's No. 1 "
Cottage "
Roger's No. 19 "
Highland "
Missouri "
Roger's No. 24 "
Jefferson "

All have made a very vigorous growth.

Figs.

The fig trees have all made a very strong growth this year. None of them were injured by the cold last winter. The Col de Signora Bianca and Early Violet fruited, but the figs did not come to maturity.

Quinces.

The quince trees have all made a good growth and blossomed last spring, but were injured by the late spring frost and did not fruit.

Nut-bearing Trees.

English and Dwarf English, Japanese and American Walnuts.
Hard and soft-shell and Languedoc Almonds.
Butternuts.
American, Spanish, Japanese Giant, and Hathaway Chestnuts.
Kentish Cob, Cosford and Corylus Avellana Filberts.
Shell-bark Hickory.
Pecans—six varieties.

All these, with the exception of the Pecans, have done remarkably well, the Corylus Avellana having begun bearing.

The consignment of Japanese fruit and ornamental trees, shrubs and climbing plants, received last spring, have all lived and made a healthy growth, as have all the trees and shrubs received from the Central Experimental Farm and other sources since the planting was begun on this farm.

Our collection of fruit and nut-bearing trees, vines, &c., which are now on the farm living and in healthy condition, embraces the following :—

	Varieties.
Apples	215
Pears	63
Plums	74
Peaches	118
Apricots	20
Nectarines	12
Cherries	55
Quinces	7
Figs	12
June berries	1

Fruit and nut-bearing trees, &c.—*Con.*

	Varieties.
Orange	1
Mulberries	4
Grapes	101
Strawberries	73
Blackberries	27
Raspberries	36
Currants	49
Gooseberries	18
Pomegranate	1
	887

Of the 49 varieties of currants, 32 are Saunders' seedlings.

NUT-BEARING TREES.

Walnuts	4
Almonds	3
Butternuts	1
Chestnuts	4
Filberts	3
Hickory	1
	16
Grand total	903

WEATHER RECORD FOR 1892.

Giving the date of the highest and lowest temperature, the rain and snow, and the number of days entirely overcast and hours of sunshine in each month, from January 1st to December 15th, inclusive.

Months.	Date of Lowest Temperature.	Date of Highest Temperature.	Rain.	Snow.	Days Entirely Overcast.	Hours of Sunshine.
	°	°	Inches.			Hrs. Min.
January	10th 7	25th 57	6·57	2½	13	55 45
February	19th 28	24th 61	3·27		8	75 37
March	31st 31	15th 74	6·01	29th—1	10	75 39
April	7th 30	20th 77	4·04		9	80 27
May	6th 37	21st 79	5·73		7	156 15
June	5th 44	27-28th 90	3·16		5	191 42
July	6th 38	27th 90	3·27		7	181 24
August	4th 46	19th 90	2·78		1	208 30
September	21st 43	12th 90	6·94		7	119 03
October	16th 33	3rd 79	5·99		9	121 54
November	25-26th 16	4th 56	14·94	4½	24	4 45
December, 1st to 15th	10th 24	12th 43	2·26	2	10	18 27
			64·$\frac{96}{100}$	10		

LIVE STOCK.

Since my last report, the following has been added to our stock :

Shorthorns.

One young bull, bought at Bow Park, Ontario.

Holsteins.

One Holstein cow, bought of Mr. A. C. Hallman, New Dundee, Ont., and a heifer and bull bred at the Central Experimental Farm.

Ayrshires.

Two Ayrshire cows, one heifer and a heifer calf, and one bull and a bullcalf, from the Experimental Farm at Indian Head, and one bull calf from the Central Experimental Farm. Since coming here, one of the Ayrshire cows has dropped twins—a bull and a heifer.

Sheep.

Two Dorset horned sheep and a ram, bought from Mr. T. W. Hector, Port Credit, Ont.

Pigs.

One Berkshire boar, and three Improved Large Yorkshire sows and a boar, bred at the Central Experimental Farm.

All these were brought to the farm in October, the only loss was one sow, which died on the way. The others are doing well in their new quarters.

The two shorthorn cows reported on last year, had each a calf last spring, a bull and a heifer. All of the shorthorn stock did very well last year.

Poultry.

In June we received from the Central Experimental Farm a setting of Langshan and Golden Poland eggs. We also brought through with the car of live stock a trio each of Light Brahmas and Dorkings. These have been added to the four breeds, Houdans, Wyandottes, Black Spanish, and White Leghorns previously had.

The present poultry house is only a temporary building, and does not afford the accommodation needed for testing the merits of the different breeds. It is hoped the accommodation required will be provided in time for the breeding season.

Stallion.

The stallion sent to the farm by the Haras National Co., was a very fine Clyde. He only got 11 mares, but there are not a large number in this valley, and there are two other stallions here.

During 1892 a very commodious barn for our work has been built, on the farm which has been of great benefit in enabling us to save the crops successfully during the rather catching weather, which prevailed here during the latter part of harvest.

Visitors.

There has been a great many more visitors at the farm this year than ever before, including a number of farmers residing in British Columbia as well as many visitors from distant points.

I have the honour to be, sir,

Your obedient servant

THOS. A. SHARPE.

STATEMENT of Expenditure on the Dominion Experimental Farms, for the Year ending 30th June, 1892.

CENTRAL EXPERIMENTAL FARM.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Cattle	1,293 75
Feed for stock, including experimental feeding of steers and swine; also veterinary services	1,684 47
Seed grain, trees, shrubs, &c	1,220 32
Implements, tools, hardware and supplies	931 43
Draining and drain tiles	244 50
Manure and fertilizers, including wages of teamsters drawing manure from city during winter	1,5[illegible]7 38
Travelling expenses	42[illegible] 66
Exhibition expenses	674 39
Blacksmithing, repairs to wagons, vehicles, &c.; also harness supplies and repairs	478 69
Books, periodicals and newspapers	235 85
Telegrams and telephones	158 14
Wages, farm work, including experimental work with grain and other farm crops; also salaries of farm foreman and director's assistant in experimental work	5,741 43
Wages, care of stock, including experiments in feeding cattle and swine	2,080 03
do horticultural department, including salary of horticulturist	2,784 54
Poultry department, including salary of poultry manager	1,061 16
Care of forest plantations, grounds and shrubbery	684 15
Dairy department	802 15
Extension of water pipes to dairy building and piggery	250 66
Contingencies, including building sidewalks, $147.45	376 02
	22,647 72

EXPERIMENTAL FARM, MARITIME PROVINCES.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Cattle and other stock	873 75
Feed for stock and veterinary services	92 19
Seed grain, trees, shrubs, &c	48 61
Implements, tools, hardware and supplies	482 70
Draining and drain tiles	669 06
Manure and fertilizers	288 49
Travelling expenses	67 23
Exhibition expenses	85 33
Blacksmithing and repairs	104 31
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,473 67
do care of stock	755 34
do office help	120 00
Contingencies	63 28
	6,523 96

EXPERIMENTAL FARM, MANITOBA.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Cattle and other stock	2,392 74
Feed for stock and veterinary services	188 51
Seed grain, trees, shrubs, &c	290 75
Implements, tools, hardware and supplies	906 25
Draining and drain tiles	33 71
Manure and fertilizers	158 35
Travelling expenses	148 10
Exhibition expenses	535 14
Blacksmithing and repairs	248 59
Telegrams and telephones	49 66
Distribution of seed grain and forest trees	211 37
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	4,005 02
do care of stock	643 91
do forestry, tree planting	162 00
do office help and mail messenger	162 67
Digging wells and supplying pumps	155 78
Contingencies	219 10
	11,911 65

EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Feed for stock and veterinary services	341 59
Seed grain, trees, shrubs, &c	159 66
Implements, tools, hardware and supplies	788 89
Manure and fertilizers	352 59
Travelling expenses	217 95
Exhibition expenses	168 15
Blacksmithing and repairs	219 33
Distribution of seed grain and forest trees	21 85
Salaries	1,400 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	4,207 02
do care of stock	1,106 75
do forestry, tree planting	292 50
do office help	70 00
Contingencies	236 77
	9,583 05

EXPERIMENTAL FARM, BRITISH COLUMBIA.

EXPENDITURES, 1st July, 1891, to 30th June, 1892.

	$ cts.
Cattle	45 00
Feed for stock and veterinary services	593 43
Seed grain, trees, shrubs, &c	228 13
Implements, tools, hardware and supplies	421 43
Manure and fertilizers	17 26
Travelling expenses	115 15
Exhibition expenses	100 15
Blacksmithing and repairs	60 07
Salaries	1,200 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,470 02
do clearing land, stumping, &c	1,738 56
do office help	150 00
Contingencies	180 48
	7,319 68

SUMMARY.

Total Expenditure for Experimental Farms, 1891-92.

	$ cts.
Central Experimental Farm, Ottawa	22,647 72
Experimental Farm for Maritime Provinces, Nappan, N.S.	6,523 96
do Manitoba, Brandon	11,911 65
do North-west Territories, Indian Head	9,583 05
do British Columbia, Agassiz	7,319 68
General Expenses.	
Printing and stationery	1,639 01
Seed grain distribution	2,474 30
Forest tree distribution	669 50
Salaries	4,000 00
Chemical department, including salaries of chemist and assistant chemist	2,554 08
Entomological and botanical department, including salaries of entomologist and botanist and assistant	2,043 91
Office help, distribution of reports and bulletins, including salaries of accountant, director's secretary and French correspondents	3,025 61
Testing the vitality of agricultural seeds, &c	607 53
	75,000 00

WM. SAUNDERS,
Director Experimental Farms.

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